Nokia Customer Care

Service Manual

RM-198 (Nokia 6085)

Mobile Terminal

Part No: 9254881 (Issue 1)

COMPANY CONFIDENTIAL

NOKIA

Amendment Record Sheet

Amendment No	Date	Inserted By	Comments
Issue 1	10/2006	ET	

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IMPORTANT

This document is intended for use by qualified service personnel only.

Warnings and cautions

Warnings

- IF THE DEVICE CAN BE INSTALLED IN A VEHICLE, CARE MUST BE TAKEN ON INSTALLATION IN VEHICLES FITTED WITH ELECTRONIC ENGINE MANAGEMENT SYSTEMS AND ANTI-SKID BRAKING SYSTEMS. UNDER CERTAIN FAULT CONDITIONS, EMITTED RF ENERGY CAN AFFECT THEIR OPERATION. IF NECESSARY, CONSULT THE VEHICLE DEALER/ MANUFACTURER TO DETERMINE THE IMMUNITY OF VEHICLE ELECTRONIC SYSTEMS TO RF ENERGY.
- THE PRODUCT MUST NOT BE OPERATED IN AREAS LIKELY TO CONTAIN POTENTIALLY EXPLOSIVE ATMOSPHERES, FOR EXAMPLE, PETROL STATIONS (SERVICE STATIONS), BLASTING AREAS ETC.
- OPERATION OF ANY RADIO TRANSMITTING EQUIPMENT, INCLUDING CELLULAR TELEPHONES, MAY INTERFERE WITH THE FUNCTIONALITY OF INADEQUATELY PROTECTED MEDICAL DEVICES. CONSULT A PHYSICIAN OR THE MANUFACTURER OF THE MEDICAL DEVICE IF YOU HAVE ANY QUESTIONS. OTHER ELECTRONIC EQUIPMENT MAY ALSO BE SUBJECT TO INTERFERENCE.
- BEFORE MAKING ANY TEST CONNECTIONS, MAKE SURE YOU HAVE SWITCHED OFF ALL EQUIPMENT.

Cautions

- Servicing and alignment must be undertaken by qualified personnel only.
- Ensure all work is carried out at an anti-static workstation and that an anti-static wrist strap is worn.
- Ensure solder, wire, or foreign matter does not enter the telephone as damage may result.
- Use only approved components as specified in the parts list.
- Ensure all components, modules, screws and insulators are correctly re-fitted after servicing and alignment.
- Ensure all cables and wires are repositioned correctly.
- During testing never activate the GSM transmitter without a proper antenna load, otherwise GSM PA may be damaged.

ESD protection

Nokia requires that service points have sufficient ESD protection (against static electricity) when servicing the phone.

Any product of which the covers are removed must be handled with ESD protection. The SIM card can be replaced without ESD protection if the product is otherwise ready for use.

To replace the covers ESD protection must be applied.

All electronic parts of the product are susceptible to ESD. Resistors, too, can be damaged by static electricity discharge.

All ESD sensitive parts must be packed in metallized protective bags during shipping and handling outside any ESD Protected Area (EPA).

Every repair action involving opening the product or handling the product components must be done under ESD protection.

ESD protected spare part packages MUST NOT be opened/closed out of an ESD Protected Area.

For more information and local requirements about ESD protection and ESD Protected Area, contact your local Nokia After Market Services representative.

Care and maintenance

This product is of superior design and craftsmanship and should be treated with care. The suggestions below will help you to fulfil any warranty obligations and to enjoy this product for many years.

- Keep the phone and all its parts and accessories out of the reach of small children.
- Keep the phone dry. Precipitation, humidity and all types of liquids or moisture can contain minerals that will corrode electronic circuits.
- Do not use or store the phone in dusty, dirty areas. Its moving parts can be damaged.
- Do not store the phone in hot areas. High temperatures can shorten the life of electronic devices, damage batteries, and warp or melt certain plastics.
- Do not store the phone in cold areas. When it warms up (to its normal temperature), moisture can form inside, which may damage electronic circuit boards.
- Do not drop, knock or shake the phone. Rough handling can break internal circuit boards.
- Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the phone.
- Do not paint the phone. Paint can clog the moving parts and prevent proper operation.
- Use only the supplied or an approved replacement antenna. Unauthorised antennas, modifications or attachments could damage the phone and may violate regulations governing radio devices.

All of the above suggestions apply equally to the product, battery, charger or any accessory.

Company Policy

Our policy is of continuous development; details of all technical modifications will be included with service bulletins.

While every endeavour has been made to ensure the accuracy of this document, some errors may exist. If any errors are found by the reader, NOKIA MOBILE PHONES Business Group should be notified in writing/e-mail.

Please state:

- Title of the Document + Issue Number/Date of publication
- Latest Amendment Number (if applicable)
- Page(s) and/or Figure(s) in error

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Battery information

Note: A new battery's full performance is achieved only after two or three complete charge and discharge cycles!

The battery can be charged and discharged hundreds of times but it will eventually wear out. When the operating time (talk-time and standby time) is noticeably shorter than normal, it is time to buy a new battery.

Use only batteries approved by the phone manufacturer and recharge the battery only with the chargers approved by the manufacturer. Unplug the charger when not in use. Do not leave the battery connected to a charger for longer than a week, since overcharging may shorten its lifetime. If left unused a fully charged battery will discharge itself over time.

Temperature extremes can affect the ability of your battery to charge.

For good operation times with Ni-Cd/NiMh batteries, discharge the battery from time to time by leaving the product switched on until it turns itself off (or by using the battery discharge facility of any approved accessory available for the product). Do not attempt to discharge the battery by any other means.

Use the battery only for its intended purpose.

Never use any charger or battery which is damaged.

Do not short-circuit the battery. Accidental short-circuiting can occur when a metallic object (coin, clip or pen) causes direct connection of the + and - terminals of the battery (metal strips on the battery) for example when you carry a spare battery in your pocket or purse. Short-circuiting the terminals may damage the battery or the connecting object.

Leaving the battery in hot or cold places, such as in a closed car in summer or winter conditions, will reduce the capacity and lifetime of the battery. Always try to keep the battery between 15°C and 25°C (59°F and 77°F). A phone with a hot or cold battery may temporarily not work, even when the battery is fully charged. Batteries' performance is particularly limited in temperatures well below freezing.

Do not dispose of batteries in a fire!

Dispose of batteries according to local regulations (e.g. recycling). Do not dispose as household waste.

Nokia 6085 Service Manual Structure

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2 Parts Lists and Component Layouts
3 Service Software Instructions
4 Service Tools and Service Concepts
5 Disassembly / Reassembly Instructions
6 BB Troubleshooting and Manual Tuning Guide
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1 — General Information

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RM-198 product selection

Nokia RM-198 supports 850/900/1800/1900 MHz bands. RM-198 supports EGPRS packet data connection (EDGE) in all these bands. Supported multislot class for both GPRS and EGPRS is MSC 10. RM-198 is based on G3.1S, RAP GSM engine.

According to GSM standard 05.05, it responds to class 4 (max. 2W) in EGSM 900, class 1 (1W) in GSM 1800 and class 1 in GSM 1900. It also supports Bluetooth 2.0 + EDR standard. The handset has a full phase 2 Type Approval and it complies with the GSM Type Approval. RM-198 also has a full CE approval and FCC approval.

The handset has a VGA camera with a 4x digital post zoom. The handset displays are used as viewfinders: the larger display for normal pictures; the small external display for self-portraits. The main display resolution is 128x160, and it supports 262, 144 colours. The external mini-display is a monochrome type display (black-and-white) with a 96x68 resolution.

RM-198 has stereo FM radio and music player, and it supports microSD card with hotswap possibility.

The MMS implementation follows the OMA MMS 1.2, AMR and SMIL.

WAP 2.0 compatible XHTML browser over HTTP/TCP/IP stack communicates with a gateway in network.

The supported user interface is S40, that is, RM-198 software is based on ISA platform.

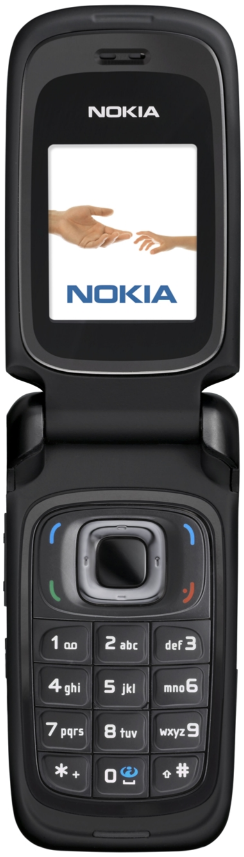

Figure 1 View of RM-198

RM-198 product features and sales package

Imaging

- VGA camera (resolution 648 X 488 pixels) with dedicated camera button, and 4x digital zoom
- Phone main display used as viewfinder: use to take normal pictures and videos.
- Standard, night, and sequential shot modes; self-timer

- Gallery for storing and editing images
- Three image-quality options: high, normal, basic
- Integrated video recorder: 3GPP spec (H.263 video and AMR audio packed in .3gp format)
- Video resolution: QCIF (176 x 144 Pixel), 15 frames per second
- Video capture time: Up to 5 min

Bearers & transport

- Quadband EGSM 900, GSM 850/1800/1900 supporting EDGE (rel. 99)
- Automatic switching between bands

Software platform

- SW platform: Nokia Series 40

Connectivity

- USB 2.0 full-speed
- Bluetooth 2.0
- Pop-Port™ connector with ACI
- Support for SIM Access Profile (SAP)
- Remote or local synchronization with a PC or other compatible device

Productivity

- PIM (Calendar & Contacts)
- Internet browser
- Video streaming (3GPP)
- Logs (last calls , timers and history list)
- Audio messaging
- Java™ MIDP 2.0, CLDC 1.13D API, PIM API, File access API
- MP3
- Data Transfer
- Settings Wizard/Access Point Configurator

Sales package

- Transceiver RM-198
- BL-5C
- AC Charger
- All-in-one User Guide (warranty card + accessory info + getting started sheet + invitational module for Club Nokia)
- CD-ROM
- Stereo Headset HS-23

Product and module list

Table 1 RM-198

Module name	Type code	Notes
Upper Module	1WJ	Connectors for display, UI PWB, HWA camera, and earpiece.
Lower Module	1Vz	Main PWB with components.
Flex Cable	1WK	The flex between the upper and lower module.

Mobile enhancements

Table 2 Audio

Enhancement	Type
Boom mono headset	HDB-4
Mono headset	HS-5
Classic stereo headset	HS-23
Loopset	LPS-4
Wireless headset	HDW-3
	HS-26W
Wireless clip-on headset	HS-21W
Wireless stereo headset	HS-12W

Table 3 Car

Enhancement	Type
Nokia car kit phone	N616
Headrest handsfree	BHF-3
Basic handsfree	HF-3
Advanced car kit (sales pack) (EURO 1)	CK-7W
Car kit	CK-10
Plug-in car handsfree	HF-6W
Mobile holder	CR-39

Table 4 Data

Enhancement	Type
Connectivity cable	CA-53
PC suite	

Table 5 Imaging

Enhancement	Type
Nokia image album	PD-1
Nokia remote camera	PT-6

Table 6 Messaging

Enhancement	Type
Nokia digital pen (Eur/US)	SU-1B
Bluetooth QWERTY keypad (Scandinavian EURO 1)	SU-8W

Table 7 Power

Enhancement	Type
Compact charger	AC-3
Battery Li-on	BL-5C
Travel charger	AC-4
Retractable charger	AC-1
Charger adapter	CA-44
Mobile charger	DC-4

Technical specifications

Transceiver general specifications

Unit	Dimensions (L x W x T)	Weight (g)	Volume (cm^3)
Transceiver with BL-5C battery	91.5x46x23mm	83.5g (without battery)	84

Main RF characteristics for GSM850/900/1800/1900 (quadband) and EDGE phones

Parameter	Unit
Cellular system	GSM850, EGSM900, GSM1800/1900 and EDGE
Rx frequency band	GSM850: 869 - 890 MHz
	EGSM900: 925 - 960 MHz
	GSM1800: 1805 - 1880 MHz
	GSM1900: 1930 - 1990 MHz

Parameter	Unit
Tx frequency band	GSM850: 824 - 849 MHz
	EGSM900: 880 - 915 MHz
	GSM1800: 1710 - 1785 MHz
	GSM1900: 1850 - 1910 MHz
Output power	GSM850: +5 ... +33dBm/3.2mW ... 2W
	GSM900: +5 ... +33dBm/3.2mW ... 2W
	GSM1800: +0 ... +30dBm/1.0mW ... 1W
	GSM1900: +0 ... +30dBm/1.0mW ... 1W
EDGE output power	EDGE850: +5 ... +29dBm/3.2mW ... 2W
	EDGE900: +5 ... +29dBm/3.2mW ... 2W
	EDGE1800: +0 ... +26dBm/1.0mW ... 1W
	EDGE1900:+0 ... +26dBm/1.0mW ... 1W
Number of RF channels	GSM850: 124
	GSM900: 194
	GSM1800: 374
	GSM1900: 299
Channel spacing	200 kHz
Number of Tx power levels	GSM850: 15
	GSM900: 15
	GSM1800: 16
	GSM1900: 16
Number of EDGE Tx power levels	GSM850 EDGE: 12
	GSM900 EDGE: 12
	GSM1800 EDGE: 14
	GSM1900 EDGE: 14

Battery endurance

Battery	Capacity (mAh)	Talk time	Stand-by
BL-5C	970mAh	Pure GSM: up to 5h. UMA: up to 6h.	Pure GSM: up to 10 days. UMA: up to 4 days.

Charging times

AC-3
Up to 3hrs 30 mins

Environmental conditions

Environmental condition	Ambient temperature	Notes
Normal operation	-15ºC...+55ºC	Specifications fulfilled
Reduced performance	-25ºC...-15ºC +55ºC...+70ºC	Operational for shorts periods only
Intermittent operation	-40ºC...-15ºC +70ºC...+85 ºC	Operation not guaranteed but an attempt to operate does not damage the phone.
No operation or storage	<-40ºC...>+85ºC	No storage or operation: an attempt may damage the phone.
Charging allowed	-25ºC...+50ºC	
Long term storage conditions	0ºC...+85ºC	

2 — Parts Lists and Component Layouts

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Exploded view

Exploded view

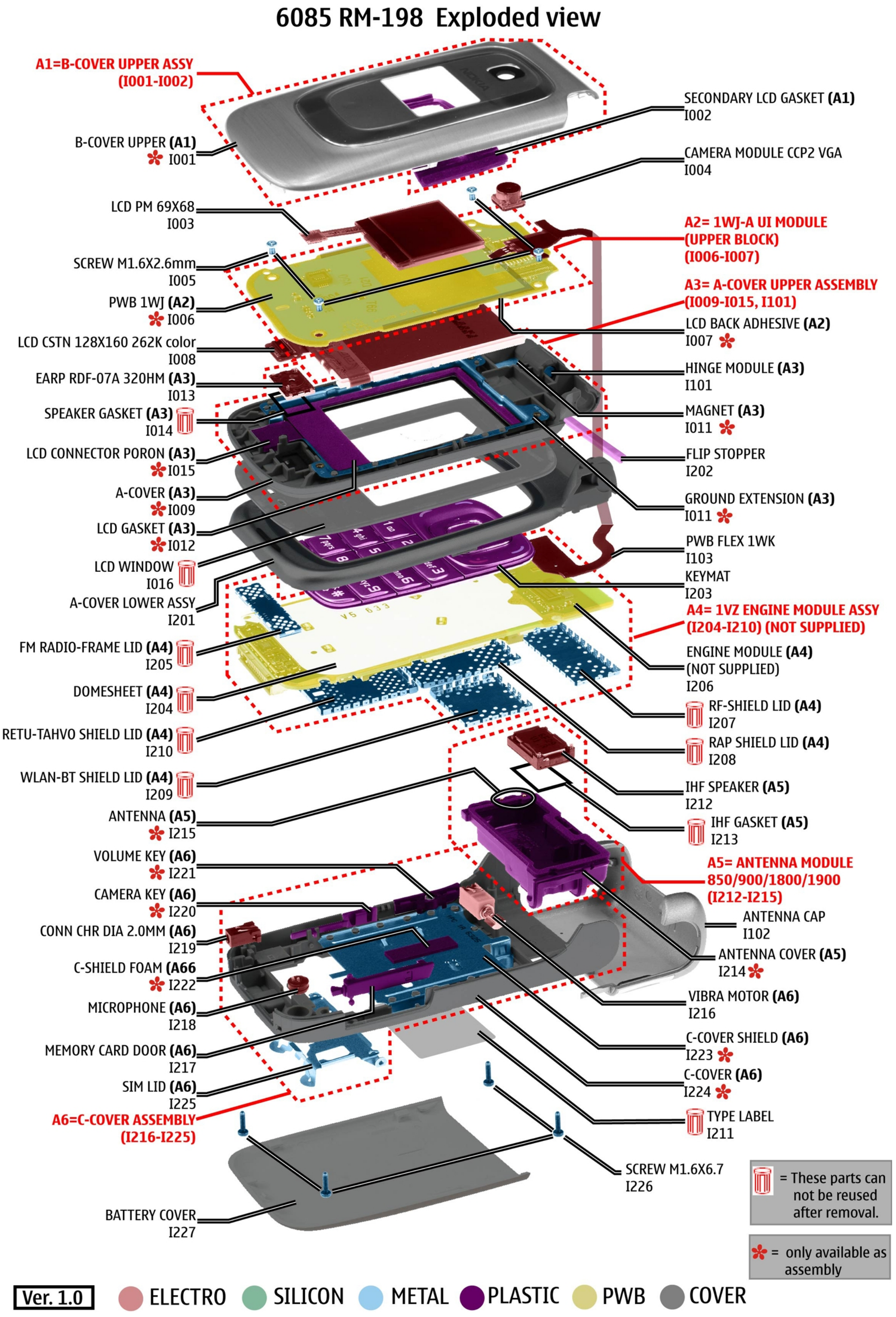

6085 RM-198 Exploded view
A1=B-COVER UPPER ASSY (I001-I002)
B-COVER UPPER (A1) I001
LCD PM 69X68 I003
SCREW M1.6X2.6mm I005
PWB 1WJ (A2) I006
LCD CSTN 128X160 262K color I008
EARP RDF-07A 320HM (A3) I013
SPEAKER GASKET (A3) I014
LCD CONNECTOR PORON (A3) I015
A-COVER (A3) I009
LCD GASKET (A3) I012
LCD WINDOW I016
A-COVER LOWER ASSY I201
FM RADIO-FRAME LID (A4) I205
DOMESHEET (A4) I204
RETU-TAHVO SHIELD LID (A4) I210
WLAN-BT SHIELD LID (A4) I209
ANTENNA (A5) I215
VOLUME KEY (A6) I221
CAMERA KEY (A6) I220
CONN CHR DIA 2.0MM (A6) I219
C-SHIELD FOAM (A66 I222
MICROPHONE (A6) I218
MEMORY CARD DOOR (A6) I217
SIM LID (A6) I225
A6=C-COVER ASSEMBLY (I216-I225)
BATTERY COVER I227
SECONDARY LCD GASKET (A1) I002
CAMERA MODULE CCP2 VGA I004
A2= 1WJ-A UI MODULE (UPPER BLOCK) (I006-I007)
A3= A-COVER UPPER ASSEMBLY (I009-I015, I101)
LCD BACK ADHESIVE (A2) I007
HINGE MODULE (A3) I101
MAGNET (A3) I011
FLIP STOPPER I202
GROUND EXTENSION (A3) I011
PWB FLEX 1WK I103
KEYMAT I203
A4= 1VZ ENGINE MODULE ASSY (I204-I210) (NOT SUPPLIED)
ENGINE MODULE (A4) (NOT SUPPLIED) I206
RF-SHIELD LID (A4) I207
RAP SHIELD LID (A4) I208
IHF SPEAKER (A5) I212
IHF GASKET (A5) I213
A5= ANTENNA MODULE 850/900/1800/1900 (I212-I215)
ANTENNA CAP I102
ANTENNA COVER (A5) I214
VIBRA MOTOR (A6) I216
C-COVER SHIELD (A6) I223
C-COVER (A6) I224
TYPE LABEL I211
SCREW M1.6X6.7 I226
= These parts can not be reused after removal.
✱ = only available as assembly
Ver. 1.0
● ELECTRO ● SILICON ● METAL ● PLASTIC ● PWB ● COVER

Figure 2 Exploded view of RM-198

Parts lists

Mechanical spare parts list

Note: For Nokia product codes, please refer to the latest Service Bulletins on the Partner Website (PWS). To ensure you are always using the latest codes, please check the PWS on a daily basis.

Ax and in bold = ASSY
"-" = NOT AVAILABLE
"XXXXXXX" = VARIANTS
"???????" = Code available in Bulletin
I0xx = ITEM codes for upper or mono block
I1xx = ITEM codes for hinge block
I2xx = ITEM codes for lower block
I3xx = ITEM codes for soldered spare parts on the upper, hinge or lower block and not exchangable

ITEM/ CIRCUIT REF.	QTY	PART NO	PART NAME	Note
A1	**1**	**XXXXXXX**	**B-COVER UPPER ASSY (I001 - I002)**	
I001	1	-	B-COVER	
I002	1	???????	SECONDARY LCD GASKET	Cannot be reused when removed.
I003	1	???????	LCD PM 69X68	
I004	1	???????	CAMERA MODULE CCP2 VGA	
I005	4	???????	SCREWS M1,6 x 2,6mm	
A2	**1**	**???????**	**1WJ-A UI MODULE (UPPER BLOCK) (I006 - I007)**	
I006	1	-	PWB 1WJ	
I007	1	-	LCD BACK ADHESIVE	
I008	1	???????	LCD CSTN 128x160 262Kcolor	
A3	**1**	**XXXXXXX**	**A-COVER UPPER ASSEMBLY (I009 - I015, I101)**	
I009	1	-	A-COVER	
I010	1	-	MAGNET	
I011	1	-	GROUND EXTENSION	
I101		???????	HINGE MODULE	
I012	1	-	LCD GASKET	
I013	1	???????	EARP RDF-07A 32OHM	
I014	1	???????	SPEAKER GASKET	Cannot be reused when removed.
I015	1	-	LCD CONNECTOR PORON	

ITEM/ CIRCUIT REF.	QTY	PART NO	PART NAME	Note
I016	1	???????	LCD WINDOW	Cannot be reused when removed.
I102		???????	ANTENNA CAP	
I103	1	???????	PWB FLEX 1WK	
I201	1	XXXXXXX	A-COVER LOWER ASSY	
I202	1	???????	FLIP STOPPER	
I203	1	XXXXXXX	KEYMAT	
A4	**1**	**-**	**1VZ ENGINE MODULE ASSY (I204 - I210)**	
I204	1	???????	DOME SHEET	Cannot be reused when removed.
I205	1	???????	FM RADIO-FRAME LID	Cannot be reused when removed.
I206	1	-	ENGINE MODULE	
I207	1	???????	RF-SHIELD LID	Cannot be reused when removed.
I208	1	???????	RAP SHIELD LID	Cannot be reused when removed.
I209	1	???????	WLAN-BT SHIELD LID	Cannot be reused when removed.
I210	1	???????	RETU-TAHVO SHIELD LID	Cannot be reused when removed.
I211	1	???????	TYPE LABEL	Cannot be reused when removed.
A5	**1**	**???????**	**ANTENNA MODULE 850/900/1800/1900 (I212 - I215)**	
I212	1	???????	IHF SPEAKER	
I213	1	???????	IHF GASKET	Cannot be reused when removed.
I214	1	-	ANTENNA COVER	
I215	1	-	ANTENNA	
A6	**1**	**XXXXXXX**	**C-COVER ASSEMBLY (I216 - I225)**	
I216	1	???????	VIBRA MOTOR	
I217	1	???????	MEMORY CARD DOOR	
I218	1	???????	MICROPHONE	
I219	1	???????	CONN CHR DIA 2.0MM	
I220	1	-	CAMERA KEY	
I221	1	-	VOLUME KEY	
I222	1	-	C-SHIELD FOAM	
I223	1	-	C-COVER SHIELD	
I224	1	-	C-COVER	

ITEM/ CIRCUIT REF.	QTY	PART NO	PART NAME	Note
I225	1	???????	SIM LID	
I226	4	???????	SCREW M1.6X6.7	Cannot be reused when removed.
I227	1	XXXXXXX	BATTERY COVER	

RM-198 component parts list

Component parts list (1VZ_12a_asmmtx)

Item	Side	Grid		Description and value			
A2000	Top	I	6	SHIELD_040_0 27333	RAP SHIELD ASSY P3046	~	~
A2100	Top	D	1	1WN_RIGID	PWB RIGID 1WN 11.9X2.5X2.1 D2	~	~
A2102	Top	E	7	PWB_1QD	PWB 1QD 10X4.6X1.5	~	~
A2400	Top	N	6	SHIELD_040_0 13002	RETU-TAHVO AHIELD ASSEMBLY	~	~
A6000	Top	J	3	SHIELD_040_0 27328	WLAN-BT SHIELD ASSY P3046	~	~
A6100	Bottom	R	5	SHIELD_040_0 08558	FM RADIO ASSY 040-008558 P2348	~	~
A7000	Top	C	5	SHIELD_040_0 13089	RF SHIELD ASSEMBLY WITH TAPE P3046	~	~
B2100	Top	Q	1	MIC_OBE_415S 42_RC3310CL	CLAPTON EMC MICROPHONE MOD -42DB SPRING	~	~
B2200	Top	P	6	CRYSTAL_3.3X 1.6_H0.9	CRYSTAL 32.768KHZ +-30PPM 12.5PF	32.768kHz	~
C2000	Top	N	8	0402C	Chipcap 5% NP0	27p	50V
C2001	Top	N	8	0603C	CHIPCAP X5R 220N K 25V 0603	220n	25V
C2002	Bottom	R	4	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2	6V3
C2003	Bottom	R	4	0402C	CHIPCAP X7R 33N K 10V 0402	33n	10V

Item	Side	Grid		Description and value			
C2004	Bottom	R	4	0402C	CHIPCAP X7R 33N K 10V 0402	33n	10V
C2005	Bottom	R	3	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2006	Bottom	R	3	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2007	Top	Q	2	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2008	Top	Q	3	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2009	Top	Q	3	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2010	Top	Q	3	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2011	Bottom	R	3	0402C	Chipcap 5% NP0	10p	50V
C2012	Bottom	R	3	0402C	Chipcap 5% NP0	10p	50V
C2013	Bottom	R	3	0402C	Chipcap 5% NP0	10p	50V
C2014	Bottom	R	3	0402C	Chipcap 5% NP0	10p	50V
C2015	Top	Q	4	0402C	CHIPCAP NP0 220P J 25V 0402	220p	25V
C2016	Top	P	8	0603C_H0.95	CHIPCAP X5R 470N K 25V 0603	470n	25V
C2071	Top	G	3	0402C	Chipcap 5% NP0	27p	50V
C2072	Top	P	2	0402C	Chipcap 5% NP0	27p	50V
C2073	Top	E	5	TANT_C_6.2X3.4_H1.7	CHIPTCAP 150U M 10V 6X3.2X1.5	150u_10V	10V
C2074	Top	F	2	0402C	Chipcap 5% NP0	10p	50V
C2100	Top	Q	2	0402C	CHIPCAP X7R 33N K 10V 0402	33n	10V
C2101	Top	Q	2	0402C	CHIPCAP X7R 33N K 10V 0402	33n	10V
C2102	Top	Q	2	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2	6V3
C2103	Top	E	8	0402C	Chipcap 5% NP0	10p	50V
C2104	Top	E	8	0402C	Chipcap 5% NP0	10p	50V
C2105	Bottom	D	2	0402C	Chipcap 5% NP0	27p	50V
C2106	Bottom	C	2	0402C	Chipcap 5% NP0	27p	50V
C2200	Top	O	5	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V

Item	Side	Grid		Description and value			
C2201	Top	P	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2202	Top	P	8	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2203	Top	P	6	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2204	Top	P	6	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2205	Top	P	5	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2206	Top	P	6	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2207	Top	P	7	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2208	Top	Q	6	0402C	Chipcap 5% NP0	27p	50V
C2209	Top	Q	6	0402C	Chipcap 5% NP0	22p	50V
C2210	Top	N	7	0603C	CHIPCAP X5R 1U K 16V 0603	1u0	16V
C2211	Top	N	7	0805C	CHIPCAP X5R 4U7 K 10V 0805	4u7	10V
C2212	Top	N	6	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C2213	Top	O	7	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C2214	Top	O	7	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C2215	Top	O	7	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C2216	Top	O	7	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C2217	Top	P	7	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C2218	Top	P	6	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2219	Top	P	7	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C2220	Top	N	6	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C2221	Top	N	8	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V

Item	Side	Grid		Description and value			
C2222	Top	N	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2223	Top	O	5	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2224	Top	P	5	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2225	Top	P	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2226	Top	O	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2227	Top	N	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2228	Top	O	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2229	Top	N	6	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2230	Top	P	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2231	Top	N	5	0603C	CHIPCAP X5R 10UF 6V3 0603	10u	4V
C2232	Top	O	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2233	Top	G	4	0603C	CHIPCAP X5R 10UF 6V3 0603	10u	4V
C2270	Top	O	5	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2271	Top	O	5	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2272	Top	O	5	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2273	Top	N	6	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2274	Top	N	6	0402C	Chipcap 5% NP0	27p	50V
C2275	Top	N	5	0402C	Chipcap 5% NP0	27p	50V
C2281	Top	O	8	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2300	Top	M	5	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2301	Top	L	5	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3

Item	Side	Grid		Description and value			
C2302	Top	N	5	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C2303	Top	L	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2304	Top	N	6	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2305	Top	L	8	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2306	Top	M	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2307	Top	L	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2309	Top	L	5	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C2310	Top	L	6	0603C	CHIPCAP X5R 10UF 6V3 0603	10u	4V
C2312	Top	L	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2313	Top	L	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2314	Top	M	7	0805C	CHIPCAP X5R 4U7 K 10V 0805	4u7	10V
C2315	Top	N	8	0805C	CHIPCAP X5R 4U7 M 25V 0805	4u7	25V
C2316	Top	N	8	0402C	Chipcap 5% NP0	56p	50V
C2317	Top	O	8	0402C	Chipcap 5% NP0	27p	50V
C2318	Top	L	8	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C2400	Top	N	4	0402C	Chipcap 5% NP0	22p	50V
C2401	Top	N	4	0402C	Chipcap 5% NP0	22p	50V
C2402	Bottom	D	7	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2403	Bottom	D	2	0402C	Chipcap 5% X7R	1n0	50V
C2404	Bottom	D	2	0402C	Chipcap 5% X7R	1n0	50V
C2406	Bottom	C	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2407	Bottom	D	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2410	Bottom	D	3	0402C	Chipcap 5% NP0	22p	50V
C2411	Bottom	D	3	0402C	Chipcap 5% NP0	22p	50V

Item	Side	Grid		Description and value			
C2412	Top	N	6	0402C	Chipcap 5% NP0	27p	50V
C2413	Bottom	C	7	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2415	Bottom	B	3	0402C	Chipcap 5% NP0	22p	50V
C2416	Bottom	D	2	0402C	Chipcap 5% NP0	22p	50V
C2700	Top	Q	3	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2800	Top	H	8	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2801	Top	F	7	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2803	Top	H	8	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2805	Top	F	7	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2806	Top	F	8	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2807	Top	I	5	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2808	Top	G	8	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2809	Top	G	8	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2812	Top	H	8	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2813	Top	F	5	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2814	Top	G	8	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2815	Top	F	7	0402C_H0.6	CHIPCAP NP0 4P7 +-0.1P 25V 0402	4p7	25V
C2816	Top	I	5	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2819	Top	I	5	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2820	Top	F	6	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2822	Top	F	5	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V

Item	Side	Grid		Description and value			
C2823	Top	I	6	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2824	Top	J	5	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2825	Top	F	7	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2826	Top	I	7	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2828	Top	I	7	0402C	Chipcap 5% NP0	27p	50V
C2829	Top	G	8	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2830	Top	H	5	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C2831	Top	I	7	0402C	Chipcap 5% NP0	27p	50V
C2833	Top	I	6	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C3000	Top	K	5	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C3001	Top	J	5	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C3002	Top	K	5	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C3003	Top	J	8	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C3004	Top	J	8	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C3005	Top	J	8	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C3006	Top	K	8	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C3007	Top	K	8	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C3008	Top	J	8	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C3009	Top	K	8	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C3200	Top	L	2	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C3201	Top	G	2	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V

Item	Side	Grid		Description and value			
C3202	Top	G	3	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C3203	Top	H	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C3204	Top	L	4	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C3205	Top	G	3	0402C	Chipcap 5% NP0	27p	50V
C6031	Top	I	2	0402C	CHIPCAP N150 18P J 50V 0402	18p	50V
C6032	Top	H	2	0402C	Chipcap 5% NP0	100p	50V
C6033	Top	H	4	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C6034	Top	H	3	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C6035	Top	I	4	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C6036	Top	H	4	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C6037	Top	H	4	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C6038	Top	H	4	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C6039	Top	H	3	0402C	CHIPCAP N150 18P J 50V 0402	18p	50V
C6040	Top	I	4	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C6051	Top	H	3	0402C	Chipcap +-0.25pF NP0	2p7	50V
C6052	Top	I	3	0402C	Chipcap +-0.25pF NP0	2p7	50V
C6055	Top	H	2	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C6056	Top	H	4	0402C	Chipcap +-0.25pF NP0	4p7	50V
C6157	Bottom	Q	4	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C6158	Bottom	Q	5	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C6164	Bottom	Q	5	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V

Item	Side	Grid		Description and value			
C6165	Bottom	R	6	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C6168	Bottom	Q	6	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C6170	Bottom	R	5	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C6176	Bottom	R	6	0402C	Chipcap 5% NP0	100p	50V
C6178	Bottom	R	6	0402C	Chipcap 5% NP0	27p	50V
C6179	Bottom	Q	6	0402C	Chipcap 5% NP0	47p	50V
C6188	Bottom	Q	6	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C6189	Bottom	Q	6	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C6190	Top	P	5	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C6191	Top	P	5	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n	16V
C6300	Top	K	4	0603C	CHIPCAP X5R 10UF 6V3 0603	10u	4V
C6301	Top	K	3	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C6303	Top	K	4	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2	6V3
C6307	Top	J	2	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C6308	Top	J	4	0402C	Chipcap +-0.25pF NP0	6p8	50V
C6329	Top	J	1	0402C	Chipcap +-0.25pF NP0	6p8	50V
C6330	Top	I	1	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2	6V3
C6331	Top	K	4	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C6335	Top	J	1	0402C	CHIPCAP NP0 220P J 25V 0402	220p	25V
C6338	Top	I	1	0402C	Chipcap 5% NP0	47p	50V
C6340	Top	I	2	0402C	Chipcap +-0.25pF NP0	6p8	50V
C6341	Top	I	2	0402C	Chipcap +-0.25pF NP0	6p8	50V

Item	Side	Grid		Description and value			
C6342	Top	I	2	0402C	Chipcap +-0.25pF NP0	6p8	50V
C6343	Top	I	2	0402C	Chipcap +-0.25pF NP0	6p8	50V
C6381	Top	K	3	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C6382	Top	K	3	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C6383	Top	I	2	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C6396	Top	I	2	0402C	Chipcap +-0.25pF NP0	6p8	50V
C6397	Top	I	2	0402C	Chipcap +-0.25pF NP0	6p8	50V
C6398	Top	J	2	0402C	Chipcap +-0.25pF NP0	6p8	50V
C6399	Top	J	2	0402C	Chipcap +-0.25pF NP0	6p8	50V
C7501	Top	B	4	0402C	Chipcap +-0.25pF NP0	2p7	50V
C7502	Top	D	4	0402C	Chipcap 5% NP0	10p	50V
C7503	Top	D	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C7504	Top	B	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C7505	Top	D	3	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C7506	Top	D	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C7507	Top	D	3	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C7508	Top	D	3	0402C	Chipcap 5% NP0	18p	50V
C7509	Top	D	3	0402C	Chipcap 5% NP0	10p	50V
C7510	Top	D	4	0402C	Chipcap 5% NP0	27p	50V
C7511	Top	C	3	0603C	CHIPCAP NP0 2N2 G 16V 0603	2n2	16V
C7513	Top	D	3	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C7514	Top	D	3	0402C	CHIPCAP X7R 33N K 10V 0402	33n	10V

Item	Side	Grid		Description and value			
C7515	Top	B	3	0402C	Chipcap +-0.25pF NP0	4p7	50V
C7516	Top	C	3	0402C	CHPCAP NP0 470P J 50V 0402	470p	50V
C7518	Top	D	4	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C7520	Top	B	7	0402C	Chipcap +-0.25pF NP0	3p3	50V
C7522	Top	D	6	0402C	Chipcap +-0.25pF NP0	1p8	50V
C7523	Top	B	7	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C7524	Top	D	6	0402C	Chipcap +-0.25pF NP0	1p8	50V
C7525	Top	D	8	0402C	Chipcap 5% NP0	18p	50V
C7586	Top	D	5	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C7590	Top	K	1	0402C	Chipcap 5% NP0	100p	50V
C7592	Top	J	1	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
D2200	Top	O	6	TFBGA_108	RETU 3.02 TSA1GJWE TFBGA108	~	~
D2420	Top	G	4	PDSO_G5	OR-GATE 2INPUT 74LVC1G32 SC70-5	~	~
D2800	Top	H	6	uBGA_289	RAPGSM V1.1 PA uBGA289	~	~
D3000	Top	J	6	FBGA133_11.1 X10.1	COMBO 256M NOR + 128M DDR DRAM FBGA133	256MNOR +128MDDR	~
F2000	Top	P	8	0603_FUSE_AV X2MATS	SM FUSE F 2.0A 32V	2A	~
G2200	Top	G	4	BATTER_EECEP	RTC BACUP CAPAC 311 SIZE FOR 2.6V 4UAH	2.6V	~
G7500	Top	B	3	VCO_DCS02733	VCO 3296-3980MHZ 4-BAND MATSUSHITA	3296-3980M Hz	~
G7501	Top	D	2	NKG3176B_H1 .0	VCTCXO 38.4MHZ 2.5V 2MA	38.4MHz	~

Item	Side	Grid		Description and value			
L2000	Top	O	8	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100MHz	~
L2001	Bottom	Q	3	0405_2_H1.0	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/ 100MHz	~
L2002	Bottom	Q	3	0405_2_H1.0	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/ 100MHz	~
L2003	Bottom	R	3	0405_2_H1.0	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/ 100MHz	~
L2004	Bottom	R	3	COIL_LK_1608	CHIP COIL 68NH J Q12/100MHZ 0603	68nH	~
L2100	Bottom	D	2	COIL_LQW1608	CHIP COIL 56N J Q38/200MHZ 0603	56nH	~
L2101	Bottom	C	2	COIL_LQW1608	CHIP COIL 56N J Q38/200MHZ 0603	56nH	~
L2202	Top	P	8	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100MHz	~
L2205	Top	P	8	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100MHz	~
L2211	Top	N	5	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100MHz	~
L2212	Top	N	6	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100MHz	~
L2270	Top	O	5	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100MHz	~
L2271	Top	O	5	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100MHz	~
L2301	Top	L	5	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100MHz	~
L2302	Top	M	5	CHOKE_SER400_H1.2	INDUCT WW 10UH 0A65 0R35 4X4X1.2	10uH	~

Item	Side	Grid		Description and value			
L2304	Top	M	7	CHOKE_SER300 _H1.5	CHOKE 22U M 0R7 0.35A 3.0x3.0x1.5	22uH	~
L2305	Top	L	7	0603_BLM	FERRITE BEAD 0R5 600R/ 100MHZ 0603	600R/ 100MHz	~
L2306	Top	M	4	0603_BLM	FERRITE BEAD 0R5 600R/ 100MHZ 0603	600R/ 100MHz	~
L2401	Bottom	B	3	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz	~
L2402	Bottom	D	2	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz	~
L2406	Top	I	8	0402L	FERRITE BEAD 0.6R 33R/ 100MHZ 0402	33R/100MHZ	~
L2407	Top	I	8	0402L	FERRITE BEAD 0.6R 33R/ 100MHZ 0402	33R/100MHZ	~
L2408	Top	I	8	0402L	FERRITE BEAD 0.6R 33R/ 100MHZ 0402	33R/100MHZ	~
L2409	Top	I	8	0402L	FERRITE BEAD 0.6R 33R/ 100MHZ 0402	33R/100MHZ	~
L3200	Top	L	2	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz	~
L6030	Top	H	3	0402L	CHIP COIL 2N7 +-0N3 Q29/800M 0402	2n7H	~
L6031	Top	I	3	0402L	CHIP COIL 2N7 +-0N3 Q29/800M 0402	2n7H	~
L6032	Top	I	4	0402L	CHIP COIL 22N J Q28/800M 0402	22nH	~
L6156	Bottom	R	5	0402LQW	CHIP COIL 47N +-3% Q25/200MHZ 0402	47nH	~

Item	Side	Grid		Description and value			
L6176	Bottom	R	6	COIL_LQW1608	CHIP COIL 120N J Q32/150MHZ 0603	120nH	~
L7500	Top	C	5	0402L	CHIP COIL 12N J Q31/800M 0402	12nH	~
L7501	Top	C	5	0402L	CHIP COIL 8N2 J Q28/800MHZ 0402	8n2H	~
L7502	Top	D	4	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz	~
L7503	Top	D	7	0402L	CHIP COIL 27N J Q27/800M 0402	27nH	~
L7504	Top	C	5	0402L	CHIP COIL 22N J Q28/800M 0402	22nH	~
L7505	Top	C	5	0402L	CHIP COIL 22N J Q28/800M 0402	22nH	~
L7515	Top	C	3	0402L	CHIP COIL 15N J Q30/800M 0402	15nH	~
N2300	Top	M	6	TFBGA_84_6.15X6.15	TAHVO V5.2 LF TFBGA84	~	~
N2301	Top	M	8	USMD8_1.69X1.69	WHITE LED DRIVER 4LEDS 500MW 8BUMP USMD8	~	~
N2402	Bottom	D	7	SENSOR_MR10	MAGNETO RESISTIVE SENSOR MRUS71D SOT4	~	~
N3200	Top	G	3	USMD16_2.03X2.03	VREG & LEVEL SHIFT LP3928 USMD16	~	2.8V
N6030	Top	H	3	CSP_47_3.85X4.05	BC4-ROM1.0RDL	~	~
N6156	Bottom	Q	5	WLCSP25_3.1X2.9	FM RECEIVER TEA5760 N1C	~	~
N6300	Top	J	3	LFBGA240	WLAN MCM STLC4550 LFBGA240	~	~
N6301	Top	J	1	RF5924	WLAN RF5924 ES3.5	~	~

Item	Side	Grid		Description and value			
N7505	Top	C	4	TFBGA144	AHNE401A TRANCEIVER TFBGA144	~	~
N7520	Top	C	7	RF9282E3.6	PA RF9282E6.5 GSM/EDGE 850/900/1800/ 1900	~	~
R2000	Bottom	Q	4	0402R	Resistor 5% 63mW	220R	~
R2001	Bottom	Q	4	uBGA11_2.15X 1.65	ASIP MIC W/ESD RES+CAP+ZDI BGA11	~	~
R2002	Top	Q	3	0402R	Resistor 5% 63mW	10R	~
R2003	Top	Q	3	0402R	Resistor 5% 63mW	10R	~
R2004	Top	Q	2	0402R	Resistor 5% 63mW	10R	~
R2005	Top	Q	3	0402R	Resistor 5% 63mW	10R	~
R2006	Bottom	Q	3	uBGA5	ASIP 4XESD **PB-FREE** BGA5	~	~
R2007	Top	Q	4	uBGA11_1.6X2 .15	ASIP SILIC USB OTG / ESD BGA11	~	~
R2008	Top	Q	4	0404_RP	RES NETWORK 0W06 220K/ 120K J 0404	220k/120k	~
R2009	Top	Q	4	0402R	Resistor 5% 63mW	220R	~
R2070	Top	P	2	0402_NTH5	NTC RES 47K J B=4050+-3% 0402	47k	~
R2071	Top	E	3	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R2100	Top	Q	2	FLIP_CHIP_8_1. 7X1.7	ASIP SINGLE ENDED MICROPHONE INTERF BGA8	~	~
R2101	Top	P	2	0402R	Resistor 5% 63mW	220R	~

Item	Side	Grid		Description and value			
R2102	Bottom	D	2	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R2103	Bottom	C	2	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R2200	Top	P	8	0402R	Resistor 5% 63mW	100k	~
R2201	Top	P	7	0402R	Resistor 5% 63mW	120k	~
R2212	Top	O	5	0402R	Resistor 5% 63mW	470R	~
R2213	Top	P	7	0402R	Resistor 5% 63mW	4k7	~
R2214	Top	P	8	0402R	Resistor 5% 63mW	4k7	~
R2216	Top	Q	7	0402R	CHIPRES 0W06 2M2 J 0402	2M2	~
R2301	Top	M	8	0402R	Resistor 5% 63mW	3k3	~
R2307	Top	L	4	0402R	Resistor 5% 63mW	100R	~
R2402	Bottom	D	7	0402R	Resistor 5% 63mW	100k	~
R2403	Top	N	6	0402R	Resistor 5% 63mW	4k7	~
R2404	Top	G	1	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R2409	Top	N	8	0402R	Resistor 5% 63mW	390R	~
R2410	Bottom	D	4	0402R	Resistor 5% 63mW	39R	~
R2411	Top	N	7	0402R	Resistor 5% 63mW	390R	~
R2416	Bottom	B	3	0402R	Resistor 5% 63mW	1k0	~
R2420	Top	H	4	0402R	Resistor 5% 63mW	100k	~
R2421	Top	G	4	0402R	Resistor 5% 63mW	100k	~

Item	Side	Grid		Description and value			
R2422	Top	G	4	0402R	Chipres 0W06 jumper 0402	0R	~
R2700	Top	Q	4	uBGA8_1.47X1.47	ASIP SIM INTERFACE **LOW CAP**BGA8	~	~
R2801	Bottom	D	3	0402R	Resistor 5% 63mW	1k0	~
R2802	Bottom	D	3	0402R	Resistor 5% 63mW	1k0	~
R2803	Top	I	8	0402R	Resistor 5% 63mW	100R	~
R2804	Top	H	8	0402R	Resistor 5% 63mW	100R	~
R2806	Top	F	6	0402R	Resistor 5% 63mW	68k	~
R3000	Top	J	5	0402R	Resistor 5% 63mW	4k7	~
R3002	Top	H	8	0402R	Resistor 5% 63mW	10R	~
R3003	Top	I	8	0402R	Resistor 5% 63mW	4k7	~
R3004	Top	K	7	0402R	Resistor 5% 63mW	4k7	~
R3200	Top	L	1	uBGA11_1.62X2.12	ASIP EMIF04-MMC02F2**PB-FREE**	~	~
R3201	Top	G	4	0402R	Resistor 5% 63mW	100k	~
R3202	Top	G	3	0402R	Resistor 5% 63mW	22k	~
R3203	Top	K	5	0402R	Resistor 5% 63mW	100k	~
R3204	Top	L	4	0402R	Resistor 5% 63mW	2k2	~
R3205	Top	G	3	0402R	Resistor 5% 63mW	33R	~
R3206	Top	G	4	0402R	Resistor 5% 63mW	33R	~
R6030	Top	H	4	0402R	Resistor 5% 63mW	10k	~

Item	Side	Grid		Description and value			
R6031	Top	H	4	0402R	Resistor 5% 63mW	10k	~
R6032	Top	I	4	0402R	CHIPRES 0W06 2R2 J 0402	2R2	~
R6034	Top	H	3	0402R	Resistor 5% 63mW	10k	~
R6035	Top	H	4	0402R	Resistor 5% 63mW	100k	~
R6156	Bottom	Q	4	0402R	Resistor 5% 63mW	10R	~
R6157	Bottom	R	6	0402R	Resistor 5% 63mW	22R	~
R6159	Bottom	R	5	0402R	Resistor 5% 63mW	10k	~
R6160	Bottom	R	4	0402R	Resistor 5% 63mW	100k	~
R6300	Top	J	2	0402R	CHIPRES 0W06 1M F 100PPM 0402	1M0	~
R6301	Top	K	3	0402R	Resistor 5% 63mW	10k	~
R6302	Top	J	4	0402R	Resistor 5% 63mW	100R	~
R6303	Top	G	5	0402R	Resistor 5% 63mW	100R	~
R6304	Top	I	4	0402R	Resistor 5% 63mW	100R	~
R6305	Top	J	2	0402R	Resistor 5% 63mW	68R	~
R7501	Top	C	3	0402R	Resistor 5% 63mW	2k2	~
R7502	Top	B	4	0402R	CHIPRES 0W06 10K F 0402	10k	~
R7503	Top	D	4	0402R	Resistor 5% 63mW	4k7	~
R7505	Top	C	3	0402R	CHIPRES 0W06 8K2 F 0402	8k2	~
R7506	Top	D	3	0402R	Resistor 5% 63mW	10R	~
R7507	Top	B	4	0402R	Resistor 5% 63mW	10R	~

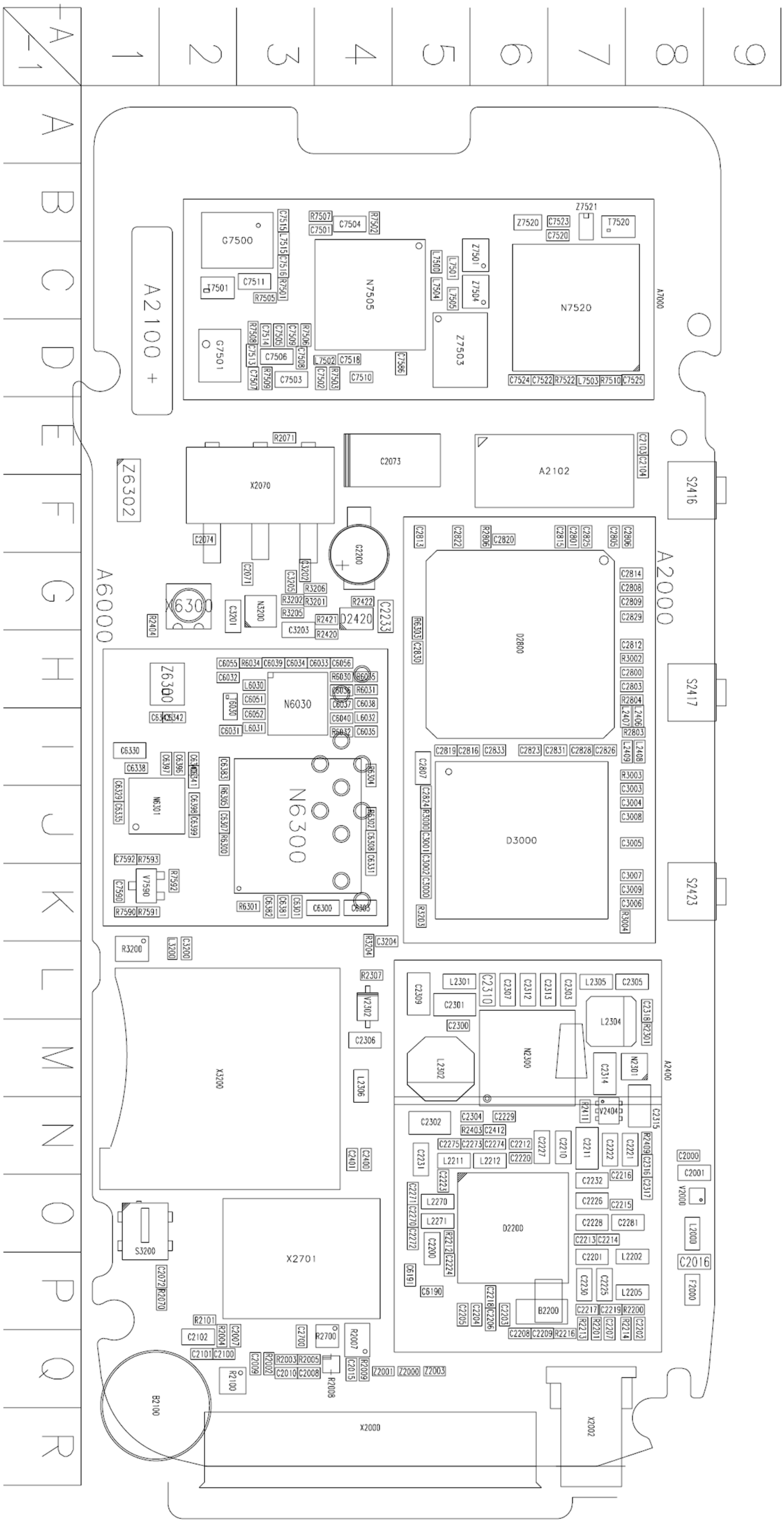
Item	Side	Grid		Description and value			
R7508	Top	D	3	0402R	Resistor 5% 63mW	10R	~
R7509	Top	D	3	0402R	Resistor 5% 63mW	22k	~
R7510	Top	D	7	0402R	Resistor 5% 63mW	15R	~
R7522	Top	D	7	0402R	CHIPRES 0W06 27K F 0402	27k	~
R7590	Top	K	1	0402R	Resistor 5% 63mW	22k	~
R7591	Top	K	1	0402R	Resistor 5% 63mW	68k	~
R7592	Top	K	2	0402R	Resistor 5% 63mW	1k5	~
R7593	Top	J	1	0402R	Chipres 0W06 jumper 0402	0R	~
S2416	Top	F	8	SWITCH_EVQ5P701K	SM SW TACT SPST 12V SIDE KEY 3N	~	~
S2417	Top	H	8	SWITCH_EVQ5P701K	SM SW TACT SPST 12V SIDE KEY 3N	~	~
S2423	Top	K	8	SWITCH_EVQ5P701K	SM SW TACT SPST 12V SIDE KEY 3N	~	~
S3200	Top	O	1	SWITCH_SPVM110201	SWITCH SPST NO 5V 1MA	~	~
T6030	Top	H	2	TRANS_LDB10	BALUN 2450 +-50MHZ 1DB 1.7X0.9	~	~
T7501	Top	C	2	TRANS_HHM1517A2	TRANSF BALUN 3800+-550MHZ 0805	~	~
T7520	Top	B	7	TRANS_LDB15	TRANSF BALUN 1800+-100mhz 2x1.25	~	~
V2000	Top	O	8	BGA_4	ASIP TVS BGA4	~	~
V2302	Top	L	4	SOD323F	SCH DI 30V 2A SOD323F	~	~
V2400	Bottom	O	6	LED_48_21SYGC	LED WHITE 140MCD 5MA 0603	~	~
V2401	Bottom	I	6	LED_48_21SYGC	LED WHITE 140MCD 5MA 0603	~	~

Item	Side	Grid		Description and value			
V2402	Bottom	I	3	LED_48_21SYGC	LED WHITE 140MCD 5MA 0603	~	~
V2403	Bottom	O	3	LED_48_21SYGC	LED WHITE 140MCD 5MA 0603	~	~
V2404	Top	N	7	SOT_666	TRX2+RX4 N 4K7/47K SOT666	~	~
V7590	Top	K	1	SOT323	Tr NPN 12V 35mA SOT323	~	~
X2000	Top	R	4	SYSCON_MQ202_NK_14R3	SM SYSTEM CONNECTOR 14POL	~	~
X2002	Top	R	7	CON_JACK_HR33NK_2DJA_2S	CONN DC-JACK 2.0MM 3POL SPR 90DEG	~	~
X2060	Bottom	B	6	TRACEABILITY_PAD	MODULE ID COMPONENT 2.8X1.8X0.3	~	~
X2070	Top	F	3	LYNX_BATT_CONN_H7.0	SM BATTERY CONN 3POL SPR 12V 2A	~	~
X2400	Bottom	C	3	CON_DF30FC_40DS_0.4V	SM B2B 2X20 P0.4 F 30V 0.3A DF30FC-40DS-0.4V	~	~
X2701	Top	P	3	SIM_CONN_470192001	SM SIM CONN 6POL P2.54	~	~
X3200	Top	M	2	MOLEX_500873_0801	CONN TRF/MICROSD 12POL P0.5 10V	~	~
X6300	Top	G	2	RF_SWITCH_MS_156	SM CONN RF JACK 50R 2W 6GHZ	~	~
X7505	Bottom	C	8	RF_SWITCH_MS_156	SM CONN RF JACK 50R 2W 6GHZ	~	~
Z2000	Top	Q	5	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz	~
Z2001	Top	Q	4	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz	~
Z2003	Top	Q	5	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz	~

Item	Side	Grid		Description and value			
Z2400	Bottom	D	6	uBGA25_2.47X 2.47	ASIP 10-CH ESD EMI FILTER BGA25	~	~
Z2403	Bottom	C	4	uBGA25_2.47X 2.47	ASIP 10-CH ESD EMI FILTER BGA25	~	~
Z2404	Bottom	C	2	uBGA25_2.47X 2.47	ASIP 10-CH ESD EMI FILTER BGA25	~	~
Z6300	Top	H	2	LFB2H2G45SG FB868	CER FILT 2450 +-50MHZ 2.5X2.0	2450MHz	~
Z6302	Top	F	1	ANT_RENM050 41	BT/WLAN 1.0 TP ANTENNA RELEASE	~	~
Z7501	Top	C	6	FILTER_2.1X1. 7_10P_H0.6	DUAL RX SAW FILTER 1800/1900MHZ 2016	1800/1900M Hz	~
Z7503	Top	D	5	MODULE_SP_L MZ_137	TX SAW MODULE GSM 850/900MHZ 4.5X3.2	850/900MHz	~
Z7504	Top	C	6	FILTER_2.1X1. 7_10P_H0.65	DUAL RX SAW FILTER 850/900MHZ 2016	850/900MHz	~
Z7520	Top	B	6	FERRITE_FBMJ 1608	FERRITE BEAD 0R01 28R/ 100MHZ 0603	28R/100MHz	~
Z7521	Top	B	7	FILTER_LFTC10 N	CER FILT LFL181699TC1 2400-2483MHZ 1.6	2400-2483M Hz	~

Component layouts

Component layout - top (1VZ_12a)


A
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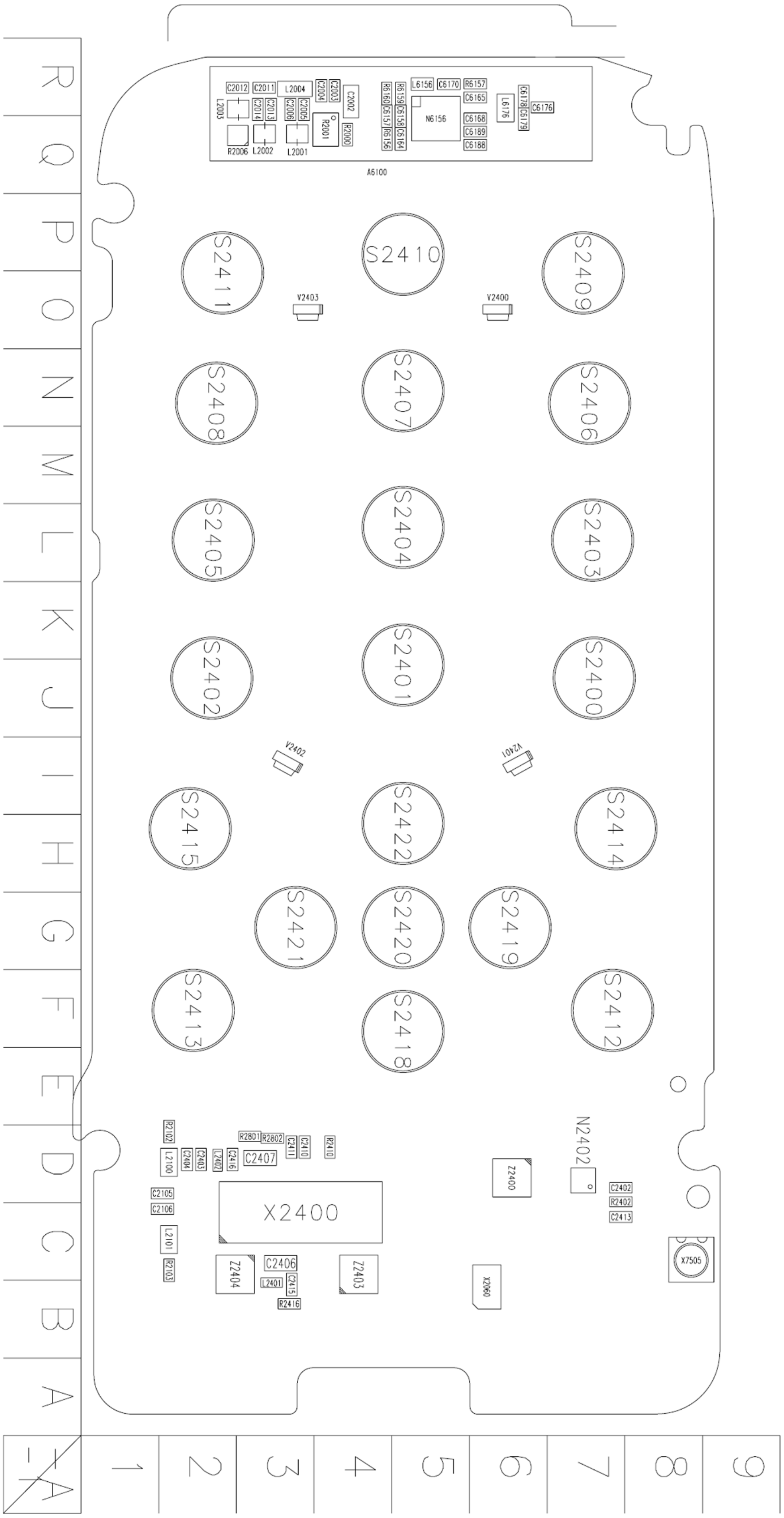
G7500
N7505
N7520
Z7503
G7501
X2070
C2073
A2102
Z6302
G2200
S2416
A6000
A2000
D2800
S2417
Z6300
N6030
N6300
N6301
D3000
S2423
X3200
N2300
L2302
L2304
D2200
X2701
S3200
B2100
X2000
X2002
B2200
C2016
F2000
L2000
V2000

Component layout - bottom (1VZ_12a)


C2012
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R6160
R6159
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C6158
R6156
C6164
L6156
C6170
R6157
C6165
N6156
C6168
C6189
C6188
L6176
C6178
C6179
C6176
A6100
S2411
S2410
S2409
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V2400
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S2412
R2102
L2100
C2404
C2403
L2402
C2416
C2407
R2801
R2802
C2411
C2410
R2410
C2105
C2106
X2400
L2101
R2103
Z2404
C2406
L2401
C2415
R2416
Z2403
Z2400
N2402
C2402
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C2413
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3 — Service Software Instructions

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Phoenix installation steps in brief

Prerequisites

Recommended hardware requirements:

- Computer processor: Pentium 700 MHz or higher
- RAM 256 MB
- Disk space 100-300 MB

Supported operating systems:

- *Windows 2000* Service Pack 3 or higher
- *Windows XP* Service Pack 1 or higher

Context

Phoenix is a service software for reprogramming, testing and tuning phones.

Phoenix installation contains:

- Service software support for all phone models included in the package
- Flash update package files for programming devices
- All needed drivers for:
  - PKD-1 (DK2) dongle
  - DKU-2 USB cable

Note: Separate installation packages for flash update files and drivers are also available, but it is not necessary to use them unless there are updates between *Phoenix* service software releases. If separate update packages are used, they should be used after *Phoenix* and data packages have been installed.

The phone model specific data package includes all changing product specific data:

- Product software binary files
- Files for type label printing
- Validation file for the faultlog repair data reporting system
- All product specific configuration files for *Phoenix* software components

Note: *Phoenix* and phone data packages should only be used as complete installation packages. Uninstallation should be made from the *Windows* Control Panel.

To use *Phoenix*, you need to:

Steps

1. Connect a PKD-1 (DK2) dongle to the computer parallel port.
2. Install *Phoenix*.
3. Install the phone-specific data package.
4. Configure users.
5. Manage connection settings (depends on the tools you are using).
   - Update FPS-10 software

     Note: There is no need to activate FPS-10.
   - Activate SX-4 smart card, if you need tuning and testing functions.

     Note: When FPS-10 is used only for product software updates, SX-4 smart card is not needed.

Results

Phoenix is ready to be used with FPS-10 flash prommer and other service tools.

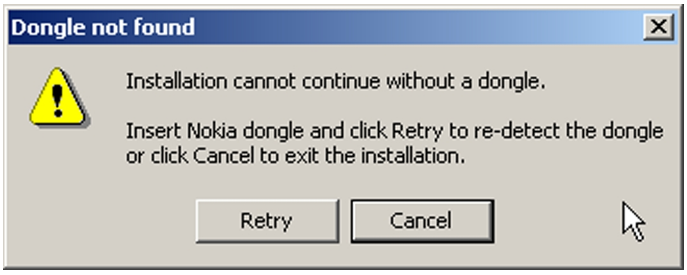
Installing *Phoenix*

Prerequisites

- Check that a dongle is attached to the parallel port of your computer.
- Download the *Phoenix* installation package (for example, *phoenix_service_sw_2004_39_x_xx.exe*) to your computer (in *C:|TEMP*, for instance).
- Close all other programs.
- Depending on your operating system, administrator rights may be required to install *Phoenix*.
- If uninstalling or rebooting is needed at any point, you will be prompted by the InstallShield program.

Context

At some point during the installation procedure, you may get the following message:



Dongle not found

Installation cannot continue without a dongle.

Insert Nokia dongle and click Retry to re-detect the dongle or click Cancel to exit the installation.

Figure 3 Dongle not found

This may be a result of a defective or too old PKD-1 dongle.

Check the COM/parallel ports used. After correcting the problem, you can restart the installation.

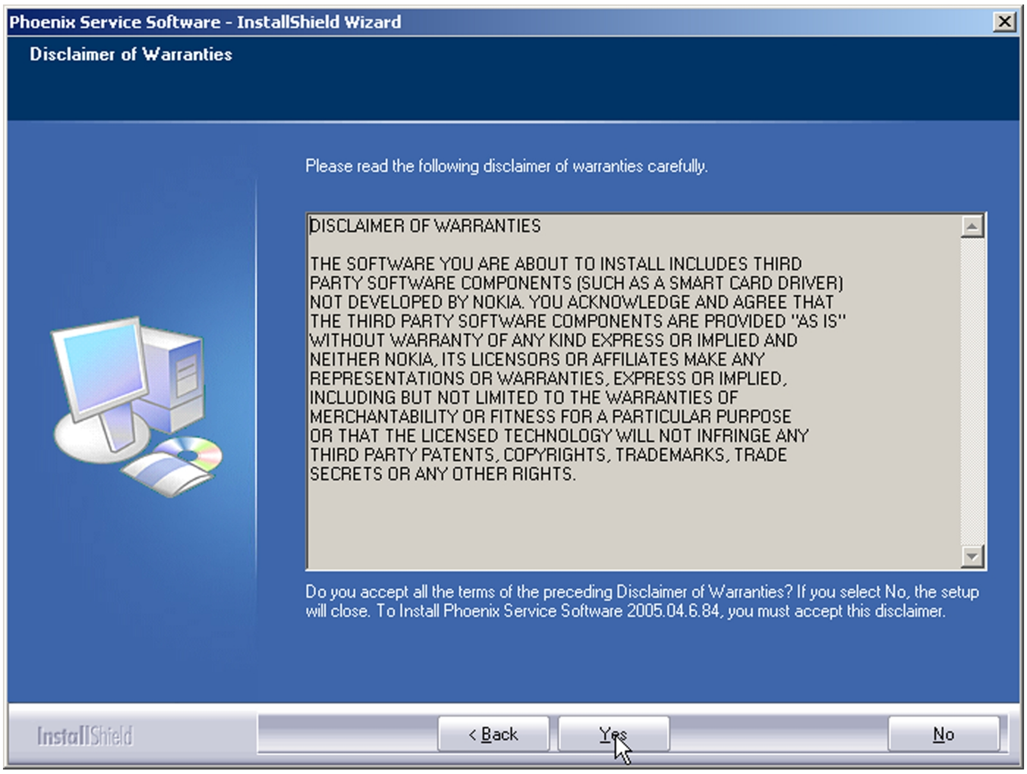
For more detailed information, please refer to *Phoenix* Help files.

> **Tip:** Each feature in *Phoenix* has its own Help function, which can be activated while running the program. Press the **F1** key or the feature's **Help** button to activate a Help file.

Steps

1. To start the installation, run the application file (for example,*phoenix_service_sw_2004_39_x_xx.exe*).
2. In the *Welcome* dialogue, click **Next**.

3. Read the disclaimer text carefully and click **Yes**.



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THE SOFTWARE YOU ARE ABOUT TO INSTALL INCLUDES THIRD PARTY SOFTWARE COMPONENTS (SUCH AS A SMART CARD DRIVER) NOT DEVELOPED BY NOKIA. YOU ACKNOWLEDGE AND AGREE THAT THE THIRD PARTY SOFTWARE COMPONENTS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND EXPRESS OR IMPLIED AND NEITHER NOKIA, ITS LICENSORS OR AFFILIATES MAKE ANY REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR THAT THE LICENSED TECHNOLOGY WILL NOT INFRINGE ANY THIRD PARTY PATENTS, COPYRIGHTS, TRADEMARKS, TRADE SECRETS OR ANY OTHER RIGHTS.

Do you accept all the terms of the preceding Disclaimer of Warranties? If you select No, the setup will close. To Install Phoenix Service Software 2005.04.6.84, you must accept this disclaimer.

Figure 4 Disclaimer text

4. Choose the destination folder.

   The default folder *C:|ProgramFiles|Nokia|Phoenix* is recommended.

5. To continue, click **Next.**

   To choose another location, click **Browse** (not recommended).

6. Wait for the components to be copied.

   The progress of the installation is shown in the *Setup Status* window.

7. Wait for the drivers to be installed and updated.

   The process may take several minutes to complete.

   If the operating system does not require rebooting, the PC components are registered right away.

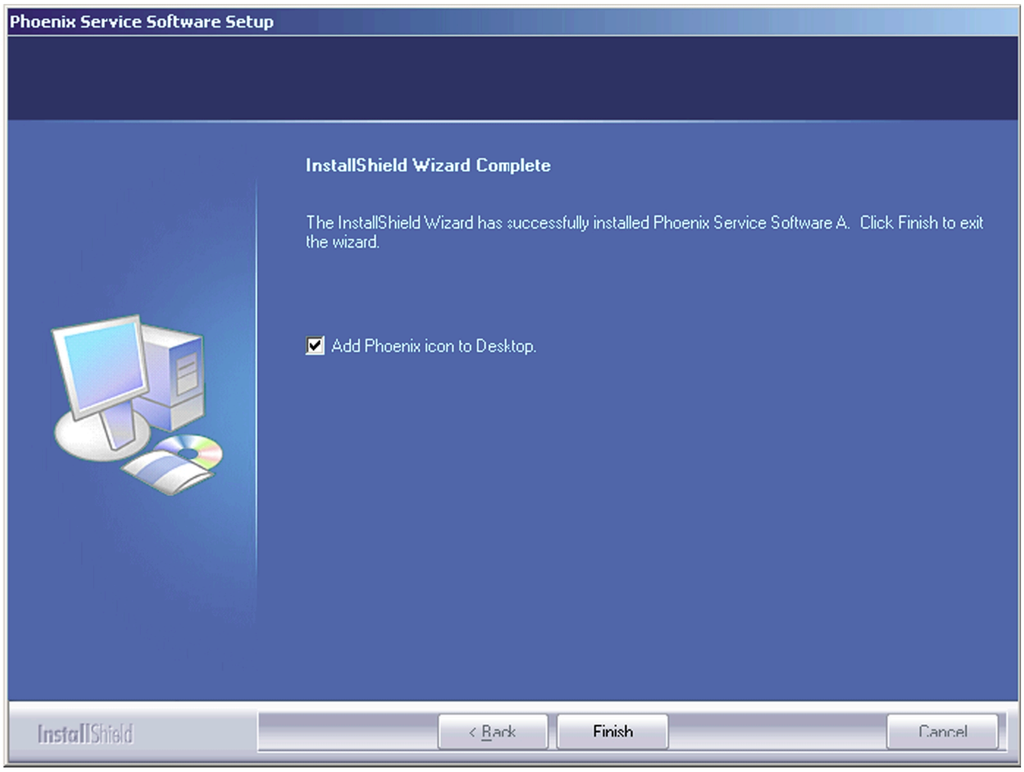
   If the operating system requires restarting your computer, the Install Shield Wizard will notifies about it.

   Select **Yes...** to reboot the PC immediately or **No...** to reboot the PC manually afterwards.

   After the reboot, all components are registered.

   Note: *Phoenix* does not work, if the components have not been registered.

8. To end the installation, click **Finish**.



Phoenix Service Software Setup

InstallShield Wizard Complete

The InstallShield Wizard has successfully installed Phoenix Service Software A. Click Finish to exit the wizard.

☑ Add Phoenix icon to Desktop.

Figure 5 InstallShield Wizard Complete

Next actions

After the installation, *Phoenix* can be used after:

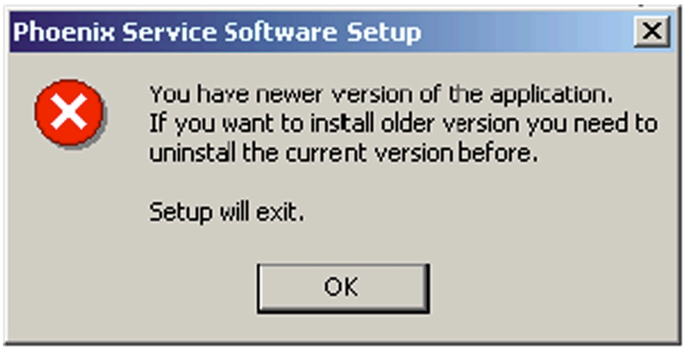
- installing phone model specific data package for *Phoenix*
- configuring users and connections

FPS-10 flash prommer can be used after updating their flash update package files.

Updating *Phoenix* installation

Context

- If you already have the *Phoenix* service software installed on your computer, you need to update the software when new versions are released.
- To update *Phoenix*, you need to follow the same steps as when installing it for the first time.
- When you are updating, for example, from version **a14_2004_16_4_47** to **a15_2004_24_7_55**, the update will take place automatically without uninstallation.
- Always use the latest available versions of both *Phoenix* and the phone-specific data package. Instructions can be found in the phone model specific Technical Bulletins and phone data package *readme.txt* files (shown during installation).
- If you try to update *Phoenix* with the same version you already have (for example, **a15_2004_24_7_55** to **a15_2004_24_7_55**), you are asked if you want to uninstall the existing version. In this case you can choose between a total uninstallation or a repair installation in a similar way when choosing to uninstall the application from the *Windows* Control Panel.
- If you try to install an older version (for example, downgrade from **a15_2004_24_7_55** to **a14_2004_16_4_47**), installation will be interrupted.



You have newer version of the application.
If you want to install older version you need to uninstall the current version before.

Setup will exit.

Figure 6 Installation interrupted

- Always follow the instructions on the screen.

Steps

1. Download the installation package to your computer hard disk.
2. Close all other programs.
3. Run the application file (for example, *phoenix_service_sw_2004_39_x_xx.exe*).

Results

A new *Phoenix* version is installed and driver versions are checked and updated.

Uninstalling *Phoenix*

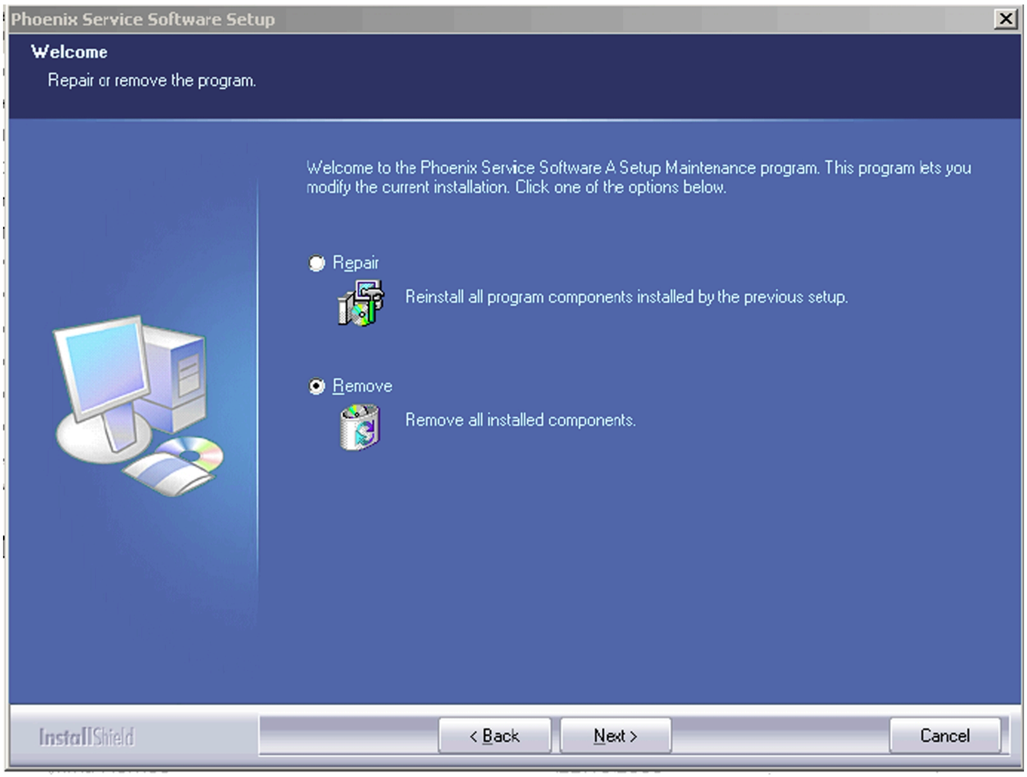
Context

You can uninstall *Phoenix* service software manually from the *Windows* Control Panel.

Steps

1. Open the **Windows Control Panel**, and choose **Add/Remove Programs**.

2. To uninstall *Phoenix*, choose **Phoenix Service Software→Change/Remove→Remove** .


Phoenix Service Software Setup
Welcome
Repair or remove the program.
InstallShield
< Back
Next >
Cancel

Welcome to the Phoenix Service Software A Setup Maintenance program. This program lets you modify the current installation. Click one of the options below.

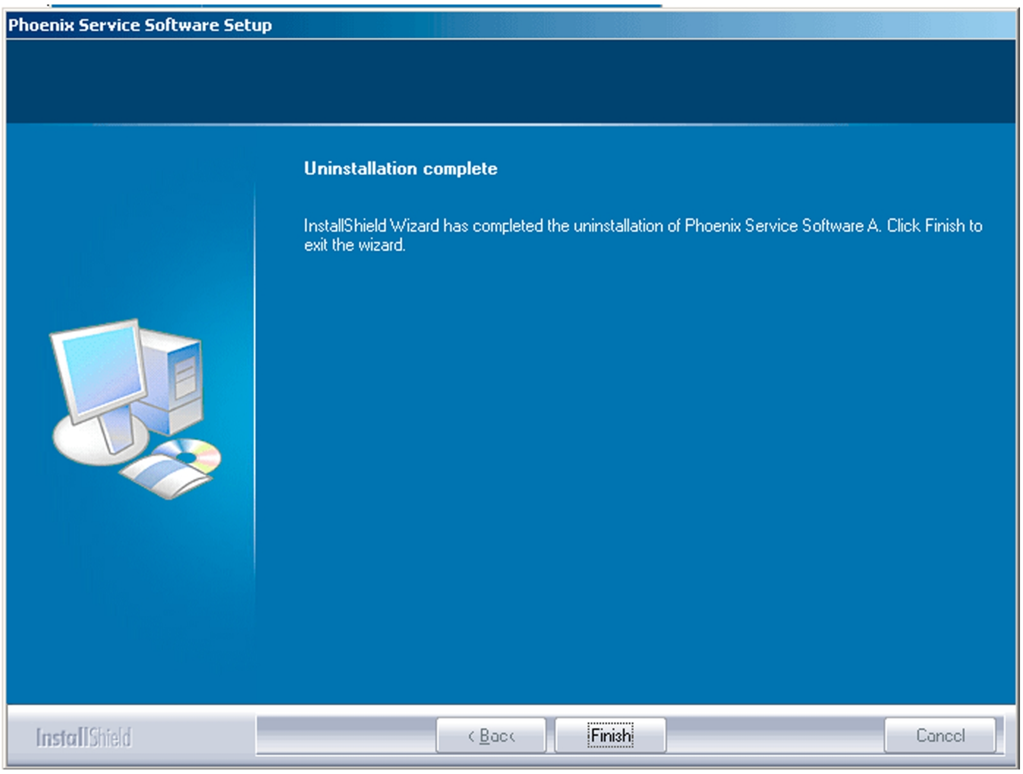
○ Repair
Reinstall all program components installed by the previous setup.

● Remove
Remove all installed components.

Figure 7 Remove program

The progress of the uninstallation is shown.

3. If the operating system does not require rebooting, click **Finish** to complete.


Phoenix Service Software Setup
InstallShield
< Back
Finish
Cancel

Uninstallation complete

InstallShield Wizard has completed the uninstallation of Phoenix Service Software A. Click Finish to exit the wizard.

Figure 8 Finish uninstallation

If the operating system requires rebooting, InstallShield Wizard will notify you. Select **Yes...** to reboot the PC immediately and **No...** to reboot the PC manually afterwards.

Repairing *Phoenix* installation

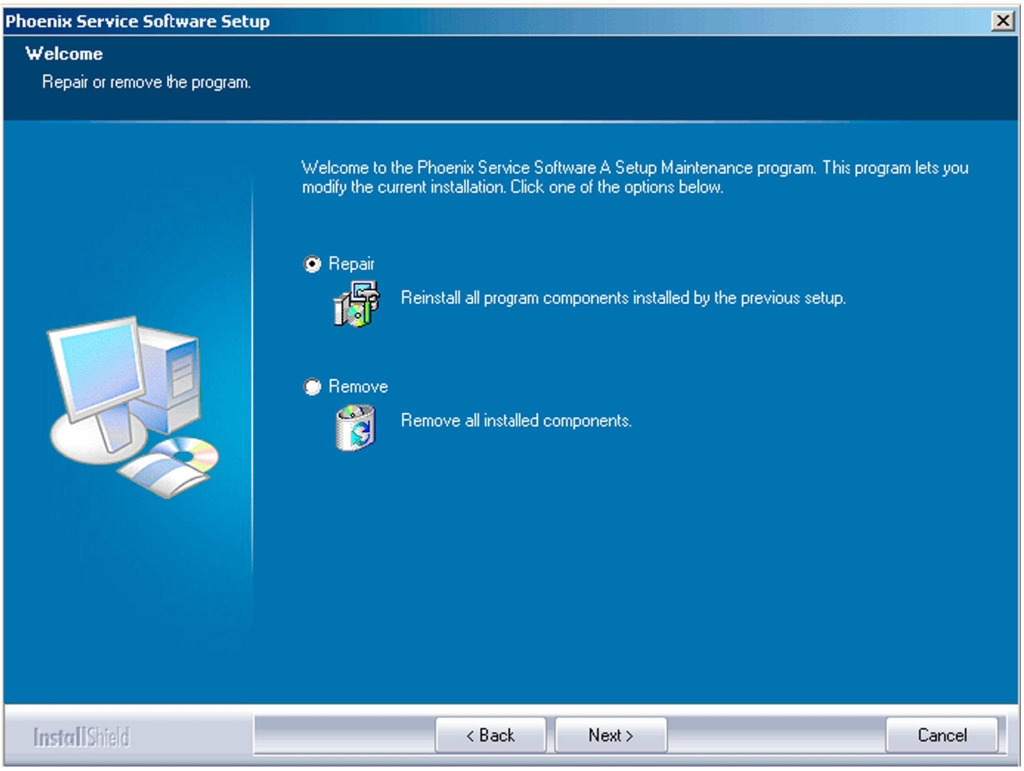
Context

If you experience any problems with the service software or suspect that files have been lost, use the repair function before completely reinstalling *Phoenix*.

> **Note:** The original installation package (for example, *phoenix_service_sw_a15_2004_24_7_55.exe*) must be found on your PC when you run the repair setup.

Steps

1. Open **Windows Control Panel→Add/Remove Programs** .
2. Choose **Phoenix Service Software→Change/Remove** .
3. In the following view, select **Repair**.



Phoenix Service Software Setup

Welcome

Repair or remove the program.

Welcome to the Phoenix Service Software A Setup Maintenance program. This program lets you modify the current installation. Click one of the options below.

● Repair
Reinstall all program components installed by the previous setup.

○ Remove
Remove all installed components.

Figure 9 Repair program

Phoenix reinstalls components and registers them.

The procedure is the same as when updating *Phoenix*.

4. To complete the repair, click **Finish**.

Phone data package overview

Each product has its own data package (DP). The product data package contains all product-specific data files to make the Phoenix service software and tools usable with a certain phone model.

The phone data package contains the following:

- Product software binary files

- Files for type label printing
- Validation file for the fault log repair data reporting system
- All product-specific configuration files for Phoenix software components

Data files are stored in **C:\Program Files\Nokia\Phoenix** (default).

Installing phone data package

Prerequisites

- A phone-specific data package contains all data required for the *Phoenix* service software and service tools to be used with a certain phone model.
- Check that a dongle is attached to the parallel port of your computer.
- Install *Phoenix* service software.
- Download the installation package (for example, *XX-XX_dp_EA_v_1_0.exe*) to your computer (for example, in C:\TEMP).
- Close all other programs.

(XX-XX = type designator of the product)

If you already have *Phoenix* installed on your computer, you will need to update it when a new version is released.

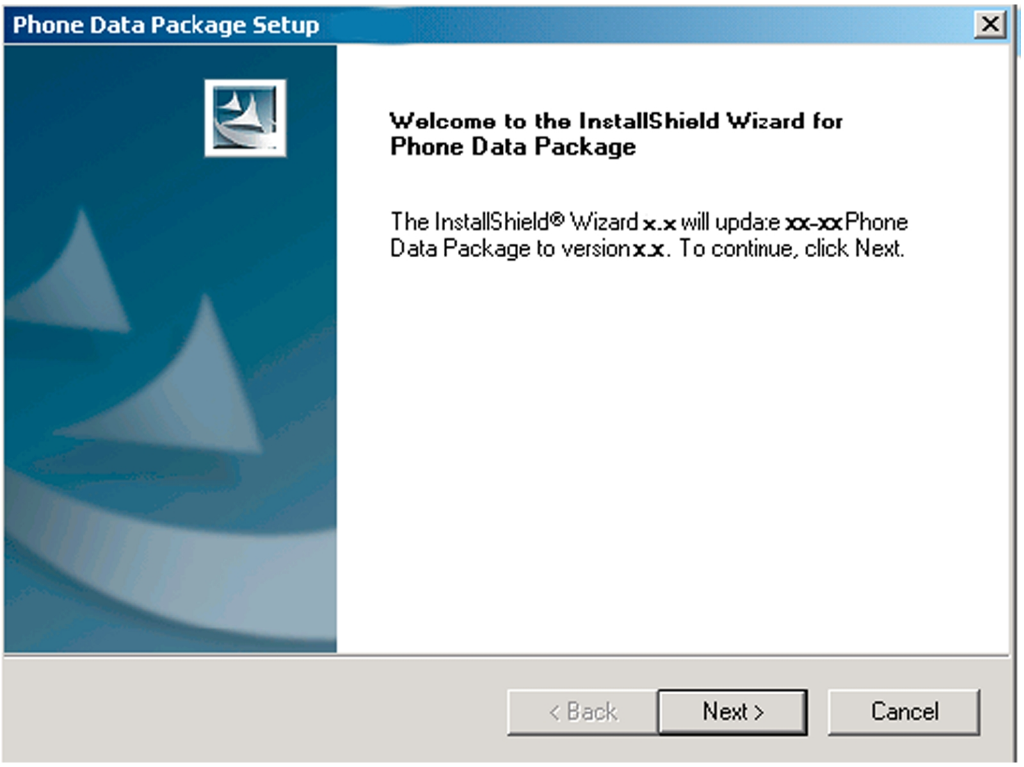
> **Note:** Often *Phoenix* and the phone-specific data package come in pairs, meaning that a certain version of *Phoenix* can only be used with a certain version of a data package. Always use the latest available versions of both. Instructions can be found in phone-specific Technical Bulletins and *readme.txt* files of data packages.

Steps

1. To start the installation, run the application file (for example, *XX-XX_dp_EA_ v_1_0.exe*),

   Wait for the installation files to be extracted.

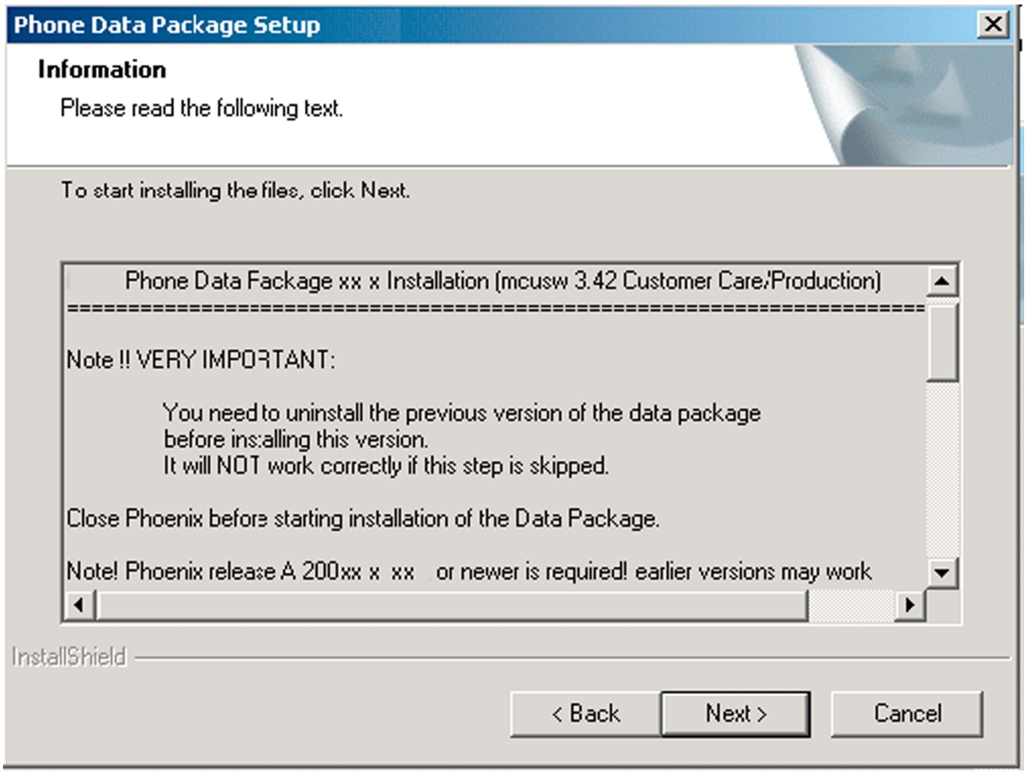
2. Click **Next**.



Welcome to the InstallShield Wizard for Phone Data Package

The InstallShield® Wizard x.x will update xx-xx Phone Data Package to version x.x. To continue, click Next.

3. In the following view you can see the contents of the data package. Read the text carefully. There is information about the *Phoenix* version required with this data package.



Information

Please read the following text.

To start installing the files, click Next.

Phone Data Package xx x Installation (mcusw 3.42 Customer Care/Production)

===

Note !! VERY IMPORTANT:

You need to uninstall the previous version of the data package
before installing this version.
It will NOT work correctly if this step is skipped.

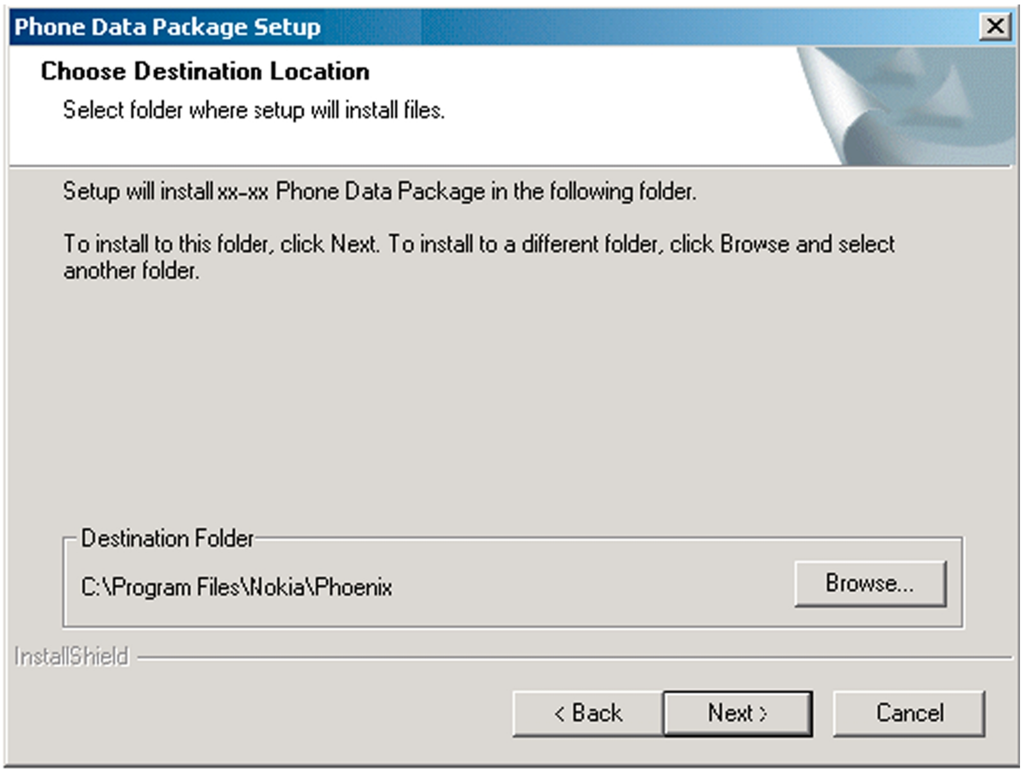
Close Phoenix before starting installation of the Data Package.

Note! Phoenix release A 200xx x xx or newer is required! earlier versions may work

Figure 10 Data package setup information

4. To continue, click **Next**.

5. Choose the destination folder, and click **Next** to continue.



Phone Data Package Setup

Choose Destination Location

Select folder where setup will install files.

Setup will install xx-xx Phone Data Package in the following folder.

To install to this folder, click Next. To install to a different folder, click Browse and select another folder.

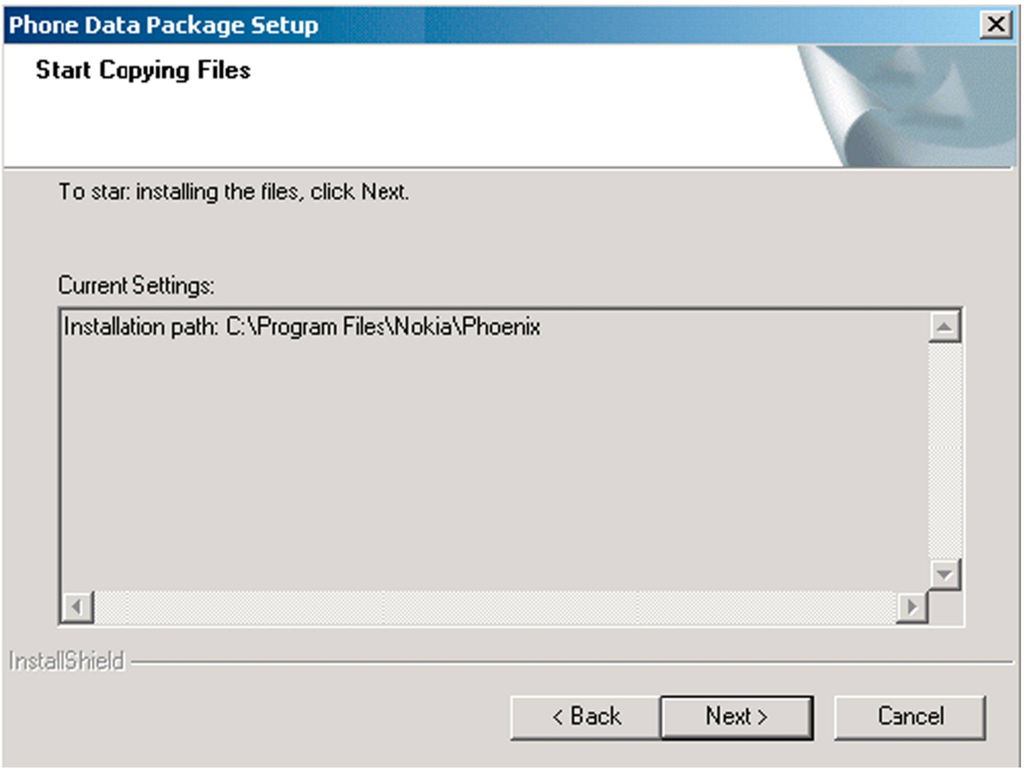
Destination Folder

C:\Program Files\Nokia\Phoenix

Figure 11 Data package destination folder

The InstallShield Wizard checks where *Phoenix* is installed, and the directory is shown.

6. To start copying the files, click **Next**.



Phone Data Package Setup

Start Copying Files

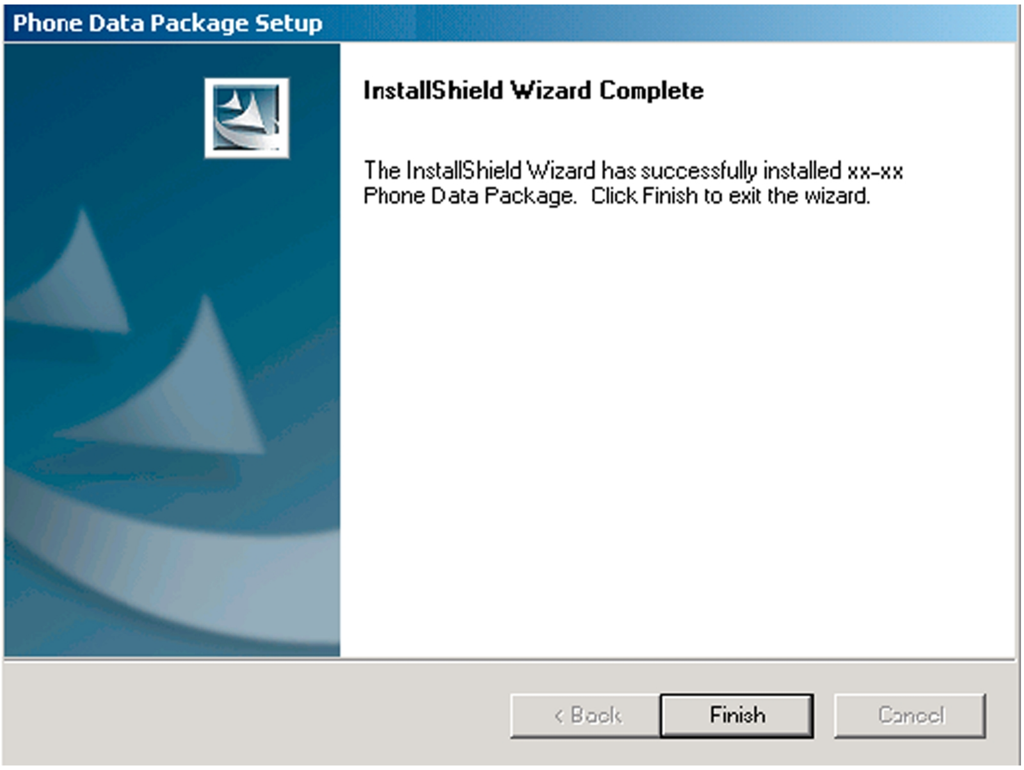
To star: installing the files, click Next.

Current Settings:

Installation path: C:\Program Files\Nokia\Phoenix

Phone model specific files are installed. Please wait.

7. To complete the installation, click **Finish**.



InstallShield Wizard Complete

The InstallShield Wizard has successfully installed xx-xx Phone Data Package. Click Finish to exit the wizard.

Figure 12 InstallShield Wizard Complete

Next actions

Phoenix can be used for flashing phones and printing type labels after:

- Configuring users
- Managing connections

FPS-10 can be used after updating their flash update package files.

Uninstalling phone data package

Context

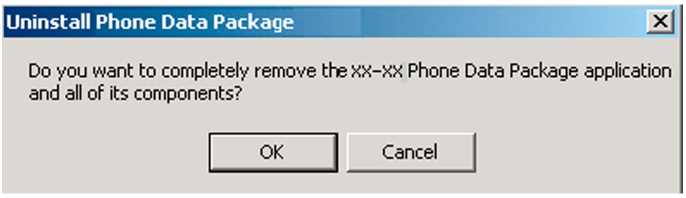
There is no need to uninstall an older version of a data package, unless instructions to do so are given in the *readme.txt* file of the data package and bulletins related to the release.

Please read all related documents carefully.

Steps

1. Locate the data package installation file (e.g. *XX-XX_dp_EA_v_1_0.exe*) from your computer.
2. To start the uninstallation procedure, double-click the data package installation file.

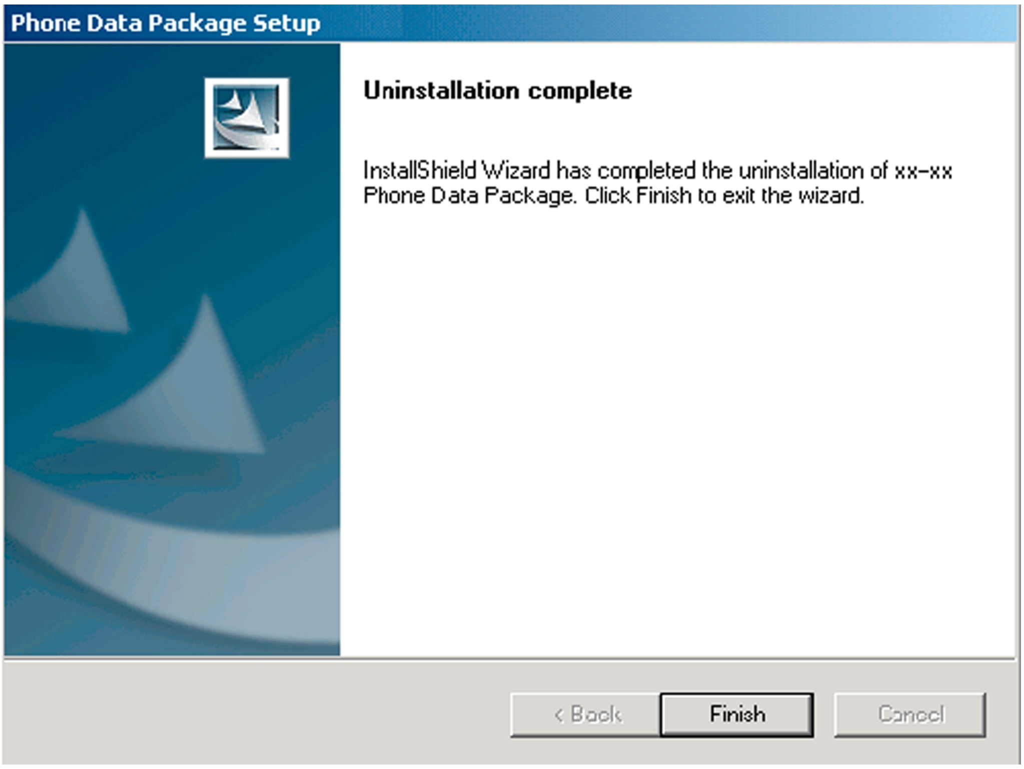
3. To uninstall the data package, click **OK** or to interrupt the uninstallation, click **Cancel**.


Uninstall Phone Data Package
OK
Cancel

Do you want to completely remove the xx-xx Phone Data Package application and all of its components?

Figure 13 Uninstalling phone data package

4. When the data package is uninstalled, click **Finish**.


Phone Data Package Setup
< Back
Finish
Cancel

Uninstallation complete

InstallShield Wizard has completed the uninstallation of xx-xx Phone Data Package. Click Finish to exit the wizard.

Figure 14 Finishing data package uninstallation

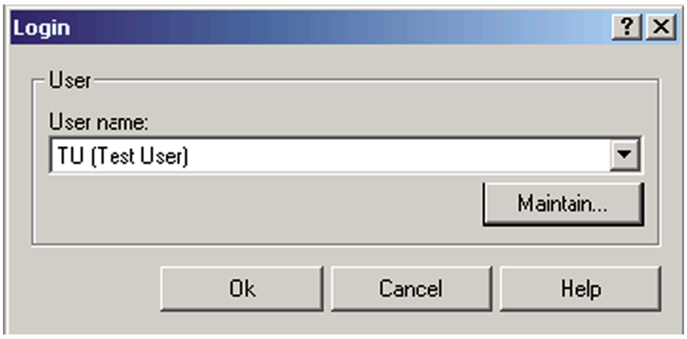
Alternative steps

- You can also uninstall the data package manually from **Control Panel→Add/Remove Programs→xx-xx* Phone Data Package** . (*= type designator of the phone).

Configuring users in *Phoenix*

Steps

1. Start *Phoenix* service software, and log in.



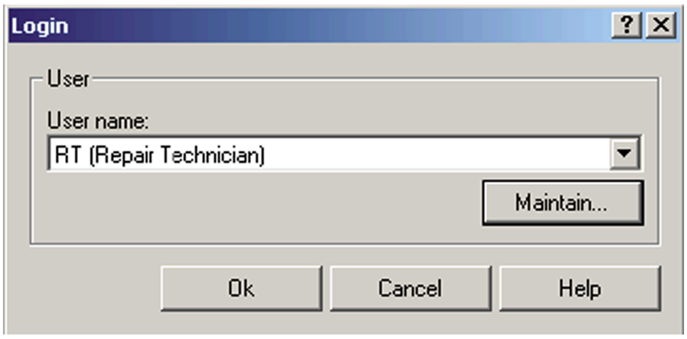
User name: TU (Test User)

Figure 15 Phoenix login

If the user ID is already configured, select s/he from the *User name* drop-down list, and click **OK**.

2. To add a new user, or to edit existing ones, click **Maintain**.
3. To add a new user, click **New**.
4. Type in the name and initials of the user, and click **OK**.

   The user is added to the user name list.
5. Select the desired user from the *User name* drop-down list, and click **OK**.



User name: RT (Repair Technician)

Figure 16 New user configured

Managing connections in *Phoenix*

Context

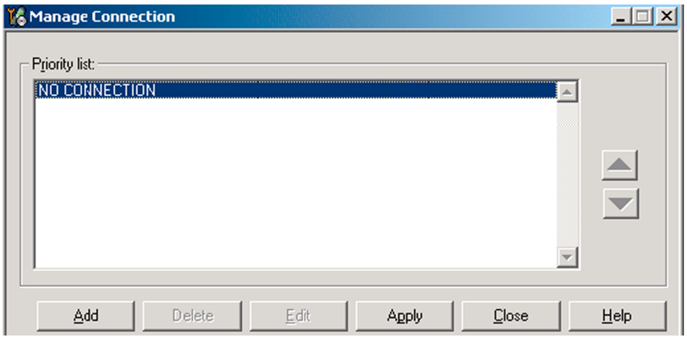
With the **Manage Connections** feature you can edit and delete existing connections or create new ones.

> **Note:** After choosing the desired connection, and connecting the phone to a PC for the first time, allow the PC to install the USB device drivers first. Please note that this may take some time to complete.
>
> If there are problems after the driver installation, check that the USB connection is active from the **Windows Control Panel**. If the problem persists, contact the local PC support.

Steps

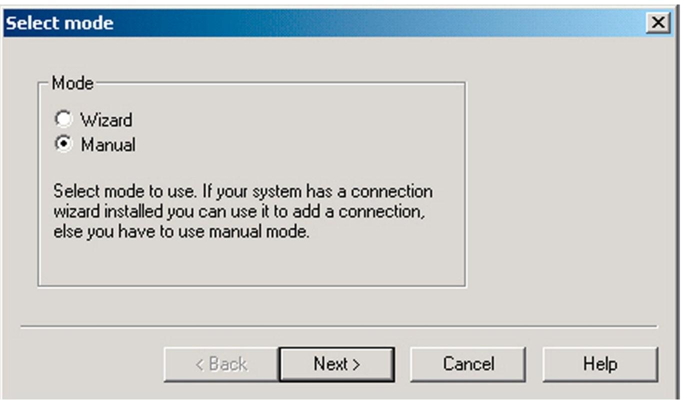
1. Start *Phoenix*, and log in.
2. Choose **File→Manage Connections...** .

3. To add a new connection, click **Add**.



4. Select **Manual** mode, and click **Next** to continue.

   If you want to create the connection using the Connection Wizard, connect the tools and a phone to your PC. The wizard will automatically try to configure the correct connection.



Select mode to use. If your system has a connection wizard installed you can use it to add a connection, else you have to use manual mode.

Figure 17 Select mode: Manual

i For an FPS-10 flash prommer with a **USB Connection**, choose the following connection settings:

- Media: **FPS-10 USB**
- DEVICE_INDEX: **0**
- SERIAL_NUM: See Serial No from the label attached to the bottom of FPS-10
- ACTIVE_MEDIA: **USB**

ii For an FPS-10 flash prommer with a **LAN connection**, choose the following connection settings:

- Media: **FPS-10 TCP/IP**
- NET_SERV_NAME: Click **Scan...**. Choose your own FPS-10 device based on the correct MAC address. See Serial No from the label attached to the bottom of your FPS-10.
- PORT_NUM: Use the default value, and click **Next**.
- PROTOCOL_FAMILY: Use the default value, and click **Next**.
- SOCKET TYPE: Use the default value, and click **Next**.
- TX_BUFFER_SIZE: Use the default value, and click **Next**.
- RX_BUFFER_SIZE: Use the default value, and click **Next**.

iii For an FPS-8 flash prommer, choose the following connection settings:

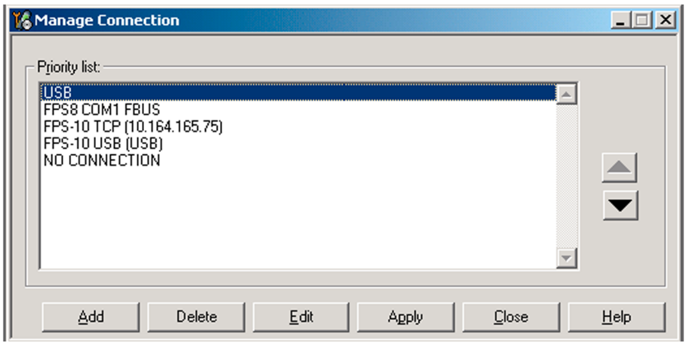
- Media: FPS-8
- PORT_NUM: COM Port where FPS-8 is connected
- COMBOX_DEF_MEDIA: **FBUS**

iv For a plain **USB connection**, choose the following connection settings:

Note: First connect the DKU-2 USB cable between the PC USB port and phone.

- Media: USB

5. To complete the configuration, click **Finish**.
6. Click the connection you want to activate. Use the up/down arrows located on the right hand side to move it on top of the list, then click **Apply**.



USB
FPS8 COM1 FBUS
FPS-10 TCP (10.164.165.75)
FPS-10 USB (USB)
NO CONNECTION

Figure 18 Connections list

The connection is activated, and it can be used after closing the *Manage Connection* window.

The connection information is shown at the right hand bottom corner of the screen.

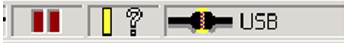
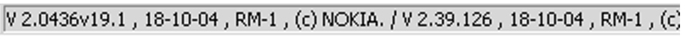


Figure 19 Connection information

7. To use the connection, connect the phone to your PC with correct service tools. Make sure the phone is switched on, and then choose **File→Scan Product** .

Results

The product support module information appears in the status bar:



V 2.0436v19.1 , 18-10-04 , RM-1 , (c) NOKIA. / V 2.39.126 , 18-10-04 , RM-1 , (c

Figure 20 Product support module information (example from RM-1)

Installing flash support files for FPS-10

Prerequisites

Note: You need to install flash support files for FPS-10 only, if you don't have the latest Phoenix available or the flash support files have changed after the latest Phoenix release.

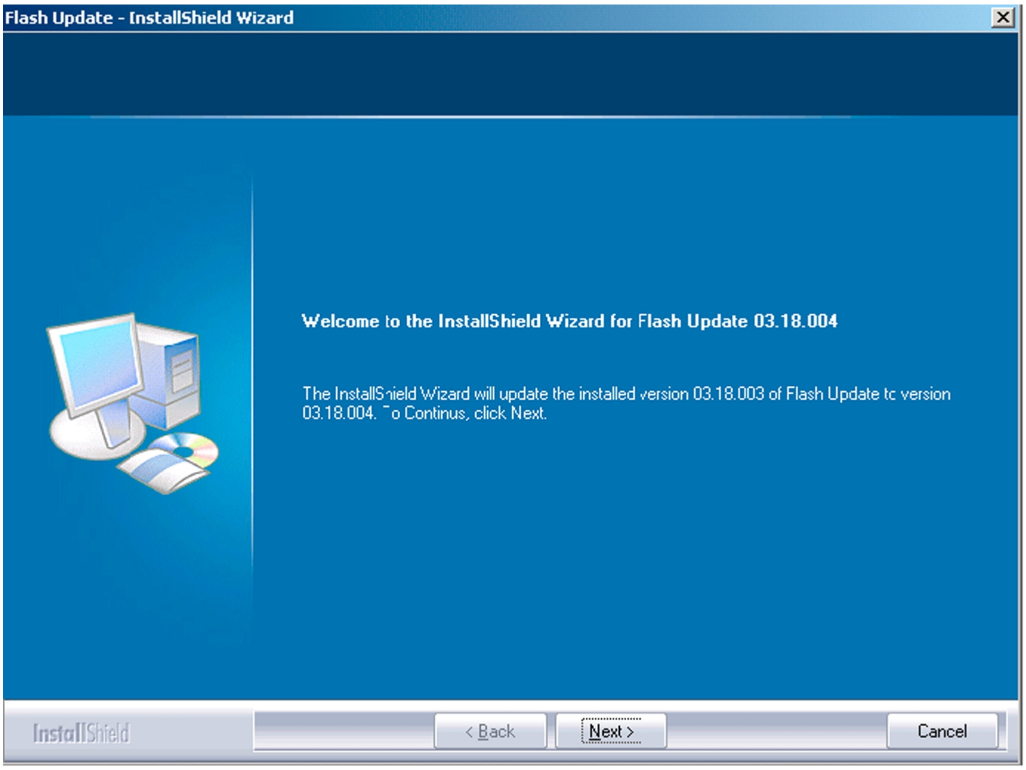
- Flash support files are installed automatically, when you install Phoenix. Use Phoenix packages later than June 2006.
- Normally it is enough to install Phoenix and the phone-specific data package because the Phoenix installation always includes the latest flash update package files for FPS-10.
- A separate installation package for flash support files is available, and the files can be updated according to this instruction, if updates appear between new Phoenix / data package releases

Context

If you are not using a separate installation package, you can skip this section and continue with updating FPS-10 flash prommer software after installing a new phone data package.

Steps

1. To begin installation, double- click *flash_update_x_yy.exe* .



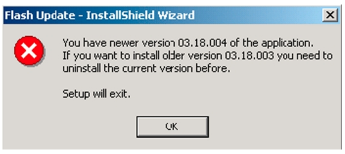
Welcome to the InstallShield Wizard for Flash Update 03.18.004

The InstallShield Wizard will update the installed version 03.18.003 of Flash Update to version 03.18.004. To Continue, click Next.

Figure 21 Flash update welcome dialog

   If the same version of Flash Update package already exists, and you want to reinstall it, the previous package is first uninstalled. Restart installation again after that.

2. If you try to downgrade the existing version to older ones, the setup will be aborted. If you really want to downgrade, uninstall newer files manually from **Control Panel** and then rerun the installation again.



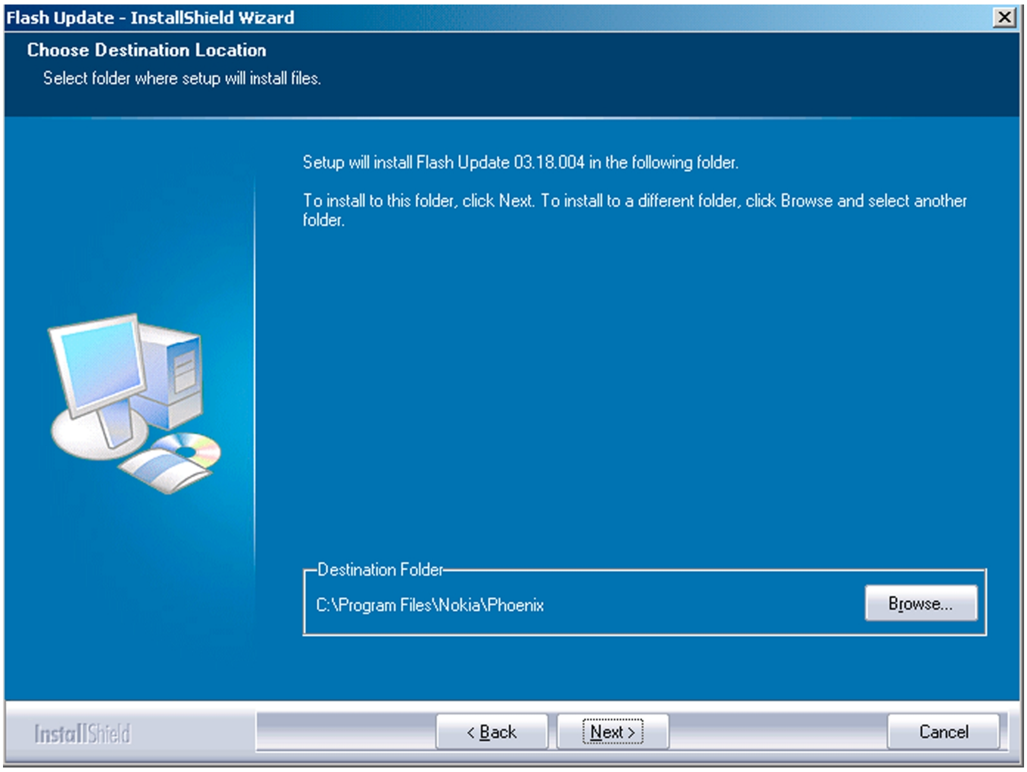
You have newer version 03.18.004 of the application.
If you want to install older version 03.18.003 you need to uninstall the current version before.

Setup will exit.

Figure 22 Flash installation interrupted

   If an older version exists on your PC and it needs to be updated, click **Next** to continue installation.

3. It is highly recommended to install the files to the default destination folder *C:|Program Files|Nokia |Phoenix*. Click **Next** to continue.



Flash Update - InstallShield Wizard
Choose Destination Location
Select folder where setup will install files.
Destination Folder
Browse...
InstallShield
< Back
Next >
Cancel

Setup will install Flash Update 03.18.004 in the following folder.

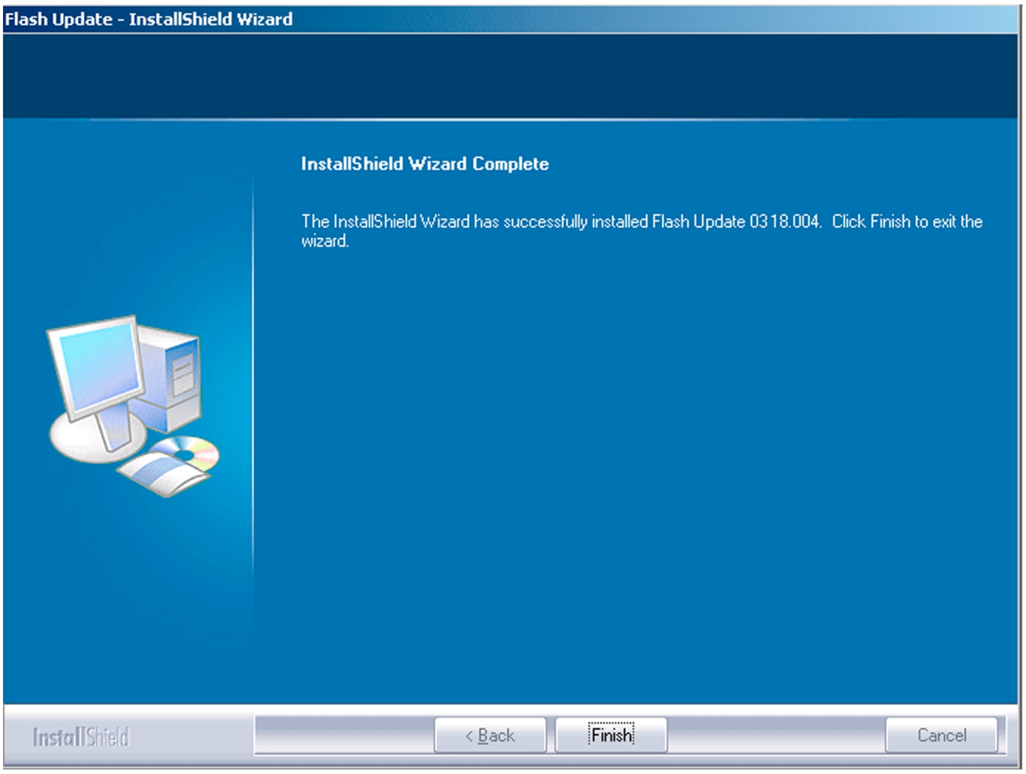
To install to this folder, click Next. To install to a different folder, click Browse and select another folder.

C:\Program Files\Nokia\Phoenix

Figure 23 Flash destination folder

When installing the flash update files for the first time you may choose another location by selecting **Browse**. However, this is not recommended.

4. To complete the installation procedure, click **Finish** .



InstallShield Wizard Complete

The InstallShield Wizard has successfully installed Flash Update 0318.004. Click Finish to exit the wizard.

Figure 24 Finish flash update

Next actions

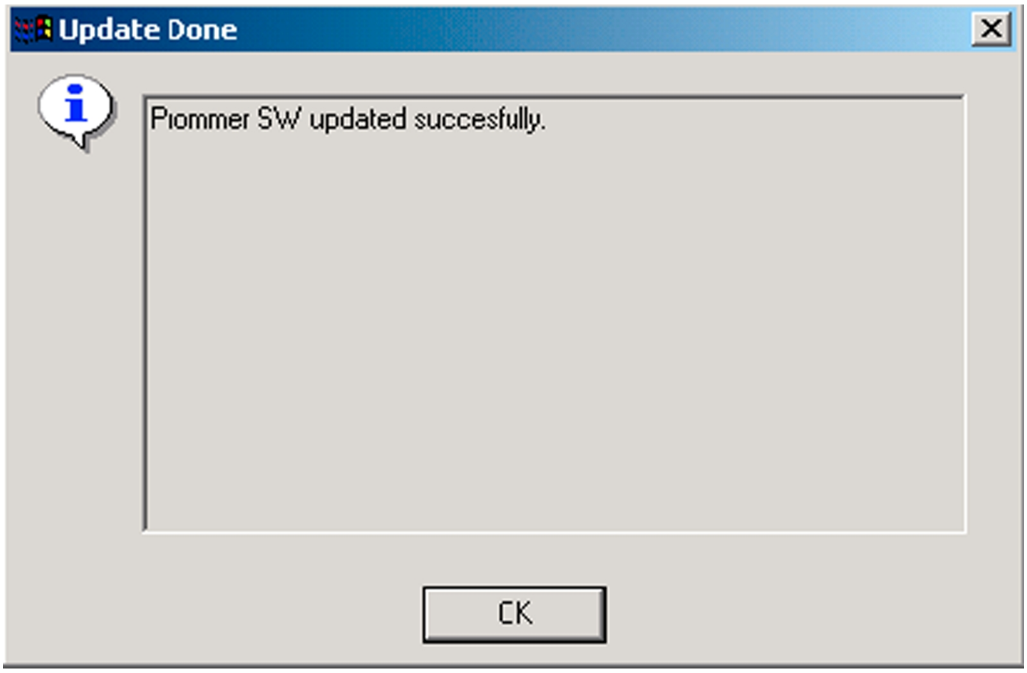
FPS-10 flash prommers must be updated using Phoenix!

Updating FPS-10 flash prommer software

Steps

1. Start *Phoenix Service Software* and log in, manage connection correctly for your flash prommer.
2. Choose **Flashing→Prommer maintenance** .
3. When the new flash update package is installed to the computer you will be asked to update the files to your Prommer. To update the files, click **Yes**. Click **OK** if the computer informs you about an unsafe removal of the device.
4. Alternatively you can update the FPS-10 flash prommer software by clicking the **Update** button.

5. Wait until you are notified that update has been successful; the procedure will take a couple of minutes. Click **OK** to close the *Update Done* window.

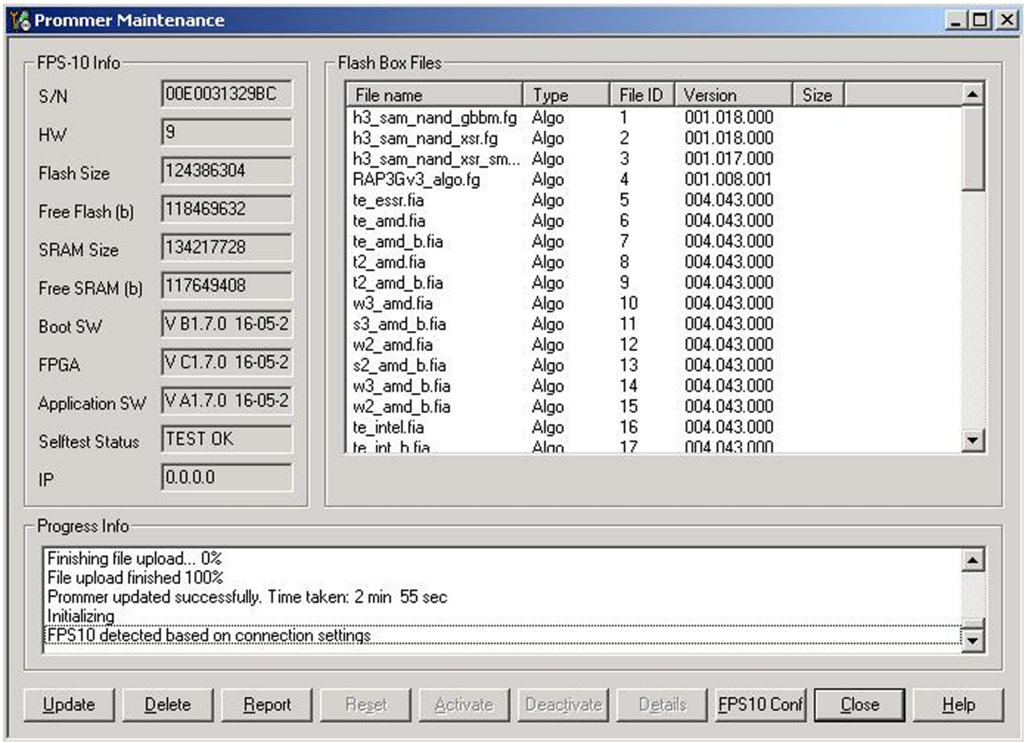


Prommer SW updated succesfully.

Figure 25 Prommer SW update finished

6. If you are using the FPS-10 flash prommer, check that it is detected from the progress info. Check also the status leds in the FPS-10. The MODE2 led (green), VBAT and POWER leds (red) should be lit. If you are using LAN connection, the LAN led (yellow) should be blinking.

7. Check that your FPS-10 flash prommer has enough memory. Flashing the SU-18 with FPS-10 needs at least 128 MB of SRAM memory in the prommer.



S/N	00E0031329BC
HW	9
Flash Size	124386304
Free Flash (b)	118469632
SRAM Size	134217728
Free SRAM (b)	117649408
Boot SW	V B1.7.0 16-05-2
FPGA	V C1.7.0 16-05-2
Application SW	V A1.7.0 16-05-2
Selftest Status	TEST OK
IP	0.0.0.0

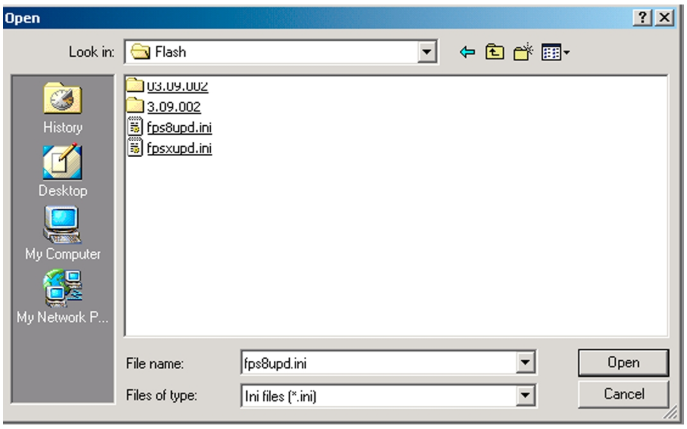
File name	Type	File ID	Version	Size
h3_sam_nand_gbbm.fg	Algo	1	001.018.000	
h3_sam_nand_xsr.fg	Algo	2	001.018.000	
h3_sam_nand_xsr_sm...	Algo	3	001.017.000	
RAP3Gv3_algo.fg	Algo	4	001.008.001	
te_essr.fia	Algo	5	004.043.000	
te_amd.fia	Algo	6	004.043.000	
te_amd_b.fia	Algo	7	004.043.000	
t2_amd.fia	Algo	8	004.043.000	
t2_amd_b.fia	Algo	9	004.043.000	
w3_amd.fia	Algo	10	004.043.000	
s3_amd_b.fia	Algo	11	004.043.000	
w2_amd.fia	Algo	12	004.043.000	
s2_amd_b.fia	Algo	13	004.043.000	
w3_amd_b.fia	Algo	14	004.043.000	
w2_amd_b.fia	Algo	15	004.043.000	
te_intel.fia	Algo	16	004.043.000	
te_int_b.fia	Algo	17	004.043.000	

```
Finishing file upload... 0%
File upload finished 100%
Prommer updated successfully. Time taken: 2 min  55 sec
Initializing
FPS10 detected based on connection settings
```

Figure 26 Prommer maintenance window

Alternative steps

- You can update FPS-10 SW by clicking the **Update** button and selecting the appropriate fpsxupd.ini file in *C:|Program Files|Nokia|Phoenix|Flash*.


Open
? ×
Look in:
Flash
History
Desktop
My Computer
My Network P...
03.09.002
3.09.002
fps8upd.ini
fpsxupd.ini
Open
Cancel

File name: fps8upd.ini

Files of type: Ini files (*.ini)

Figure 27 Flash directory window

- All files can be loaded separately to the prommer used. To do this, click the right mouse button in the *Flash box files* window and select the file type to be loaded.

  More information can be found in Phoenix **Help**.

4 — Service Tools and Service Concepts

(This page left intentionally blank.)

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- Flash concept with FPS-10....4–11
- MJ-111 module jig concept....4–12
- POS (Point of Sale) flash concept....4–13
- Service concept for RF testing and RF/BB tuning....4–14
- CU-4 flash concept with FPS-10....4–15
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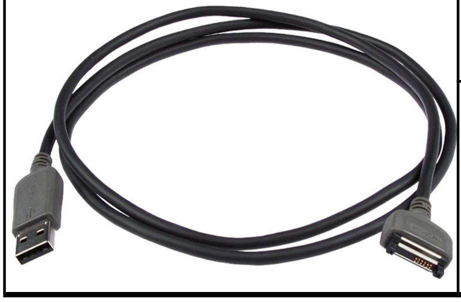
Service tools

The table below gives a short overview of service tools that can be used for testing, error analysis and repair of product RM-198, refer to various concepts.

	ACP-8E	Charger	0675195
	Charger (for Europe) Output: 5.3V DC, 500 mA.		
	CA-35S	Power cable	
	CA-35S is a power cable for connecting, for example, the FPS-10 flash prommer to the Point-Of-Sales (POS) flash adapter.		
	CA-53	USB connectivity cable	
	USB to system connector cable.		

CU-4	Control unit	

CU-4 is a general service tool used with a module jig and/or a flash adapter. It requires an external 12 V power supply.

The unit has the following features:

- software controlled via USB
- EM calibration function
- Forwards FBUS/Flashbus traffic to/from terminal
- Forwards USB traffic to/from terminal
- software controlled BSI values
- regulated VBATT voltage
- 2 x USB2.0 connector (Hub)
- FBUS and USB connections supported

When using CU-4, note the special order of connecting cables and other service equipment:

Instructions

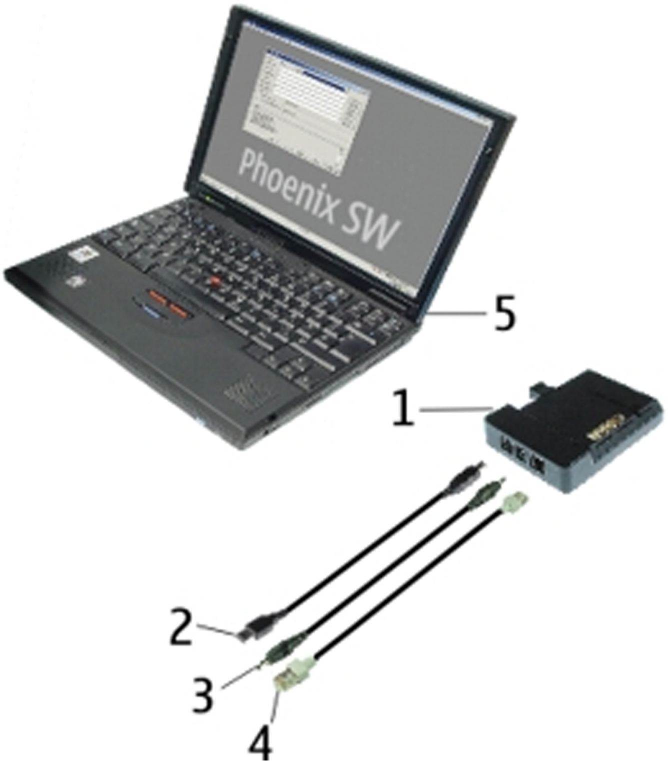
1 Connect a service tool (jig, flash adapter) to CU-4.

2 Connect CU-4 to your PC with a USB cable.

3 Connect supply voltage (12 V)

4 Connect an FBUS cable (if necessary).

5 Start Phoenix service software.



Note: Phoenix enables CU-4 regulators via USB when it is started.

Reconnecting the power supply requires a Phoenix restart.

DAU-9S	MBUS cable	

The MBUS cable DAU-9S has a modular connector and is used, for example, between the PC's serial port and module jigs, flash adapters or docking station adapters.

Note: Docking station adapters valid for DCT4 products.

NOKIA
FLS-4S

FLS-4S	Flash device	

FLS-4S is a dongle and flash device incorporated into one package, developed specifically for POS use.

FPS-10	Flash prommer	

FPS-10 interfaces with:

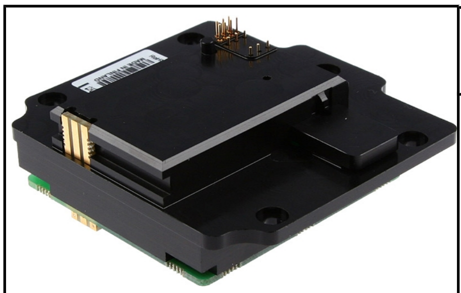
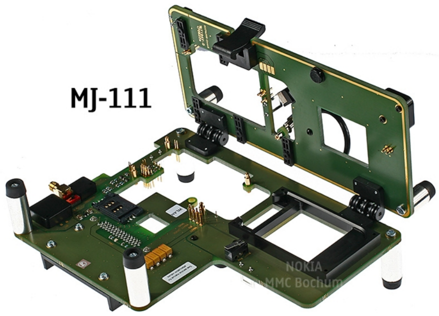
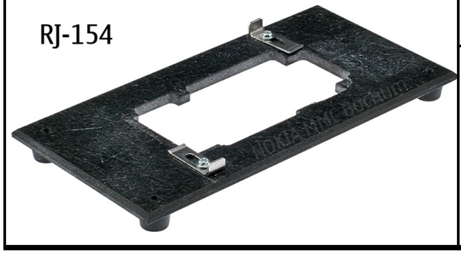
- PC
- Control unit
- Flash adapter
- Smart card

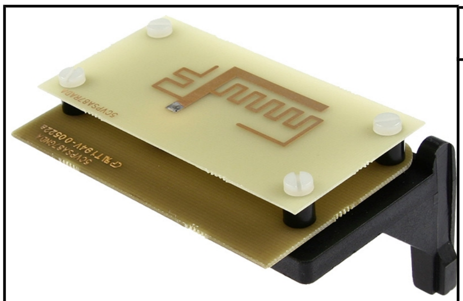
FPS-10 flash prommer features:

- Flash functionality for BB5 and DCT-4 terminals
- Smart Card reader for SX-2 or SX-4
- USB traffic forwarding
- USB to FBUS/Flashbus conversion
- LAN to FBUS/Flashbus and USB conversion
- Vusb output switchable by PC command

FPS-10 sales package includes:

- FPS-10 prommer
- Power Supply with 5 country specific cords
- USB cable

<table>
<tr><td rowspan="2"></td><td>FS-10</td><td>product specific adapter</td><td></td></tr>
<tr><td colspan="3">Flash adapter FS-10 is used for phone testing and flashing. FS-10 is used with the generic flash adapter base and control Unit CU-4 or interface adapter.
When flashing or system testing the phone, the adapter is attached to replace the phone own battery. All functions (as well as the calibration voltages, current and the protections for over voltages, over current and voltage polarity), are performed by CU-4.</td></tr>
<tr><td rowspan="2"> </td><td>MJ-111</td><td>Module jig</td><td></td></tr>
<tr><td colspan="3">MJ-111 is meant for component level troubleshooting.</td></tr>
<tr><td rowspan="2"> </td><td>PCS-1</td><td>Power cable</td><td></td></tr>
<tr><td colspan="3">The PCS-1 power cable (DC) is used with a docking station, a module jig or a control unit to supply a controlled operating voltage.</td></tr>
<tr><td rowspan="2"> </td><td>PKD-1</td><td>SW security device</td><td></td></tr>
<tr><td colspan="3">SW security device is a piece of hardware enabling the use of the service software when connected to the parallel (LPT) port of the PC.
Without the device, it is not possible to use the service software.
Printer or any such device can be connected to the PC through the device if needed.</td></tr>
<tr><td rowspan="2"> </td><td>RJ-154</td><td>Soldering jig</td><td></td></tr>
<tr><td colspan="3">RJ-154 is used as a soldering jig for the engine module.</td></tr>
</table>



SA-87 | RF coupler

SA-87 is a coupler for GSM RF testing. It is used together with FS-10 flash adapter.

- **Attenuation values for inductive RF coupler SA-87**

Band	Channel	Attenuation RX	Tolerance RX	Attenuation TX	Tolerance TX
GSM 850	Low	4,8	+/-2dB	5,4	+/-2dB
	Mid	5,0		5,0	
	High	5, 3		4,8	
GSM 900	Low	5,0	+/-2dB	5,0	+/-2dB
	Mid	5,3		5,5	
	High	5,8		6,2	
GSM 1800	Low	10,3	+/-3dB	11,3	+/-3dB
	Mid	9,3		11,5	
	High	9,3		10,8	
GSM 1900	Low	10,0	+/-3dB	9,5	+/-3dB
	Mid	9,5		9,8	
	High	9,5		9,5	

SS-104 | Domesheet and display alignment jig

SS-104 is used for domesheet and display alignment.

SS-46 | Interface adapter

SS-46 acts as an interface adapter between the flash adapter and FPS-10.

<table>
<tr><td rowspan="2"> </td><td>SS-62</td><td>Flash adapter base</td><td></td></tr>
<tr><td colspan="3">Generic base for flash adapters and couplers.</td></tr>
<tr><td rowspan="2"> </td><td>SS-88</td><td>Camera removal tool</td><td></td></tr>
<tr><td colspan="3">The camera removal tool SS-88 is used to remove/attach the front camera module from/to the socket.</td></tr>
<tr><td rowspan="2"> </td><td>SX-4</td><td>Smart card</td><td></td></tr>
<tr><td colspan="3">SX-4 is a BB5 security device used to protect critical features in tuning and testing.
SX-4 is also needed together with FPS-10 when DCT-4 phones are flashed.</td></tr>
<tr><td rowspan="2"> </td><td>XCS-4</td><td>Modular cable</td><td></td></tr>
<tr><td colspan="3">XCS-4 is a shielded (one specially shielded conductor) modular cable for flashing and service purposes.</td></tr>
</table>

<table>
<tr><td rowspan="2"> </td><td>XRS-6</td><td>RF cable</td><td></td></tr>
<tr><td colspan="3">The RF cable is used to connect, for example, a module repair jig to the RF measurement equipment.
SMA to N-Connector approximately 610 mm.
Attenuation for:
• GSM850/900: 0.3+-0.1 dB
• GSM1800/1900: 0.5+-0.1 dB
• WLAN: 0.6+-0.1dB</td></tr>
</table>

Service concepts

Flash concept with FPS-10

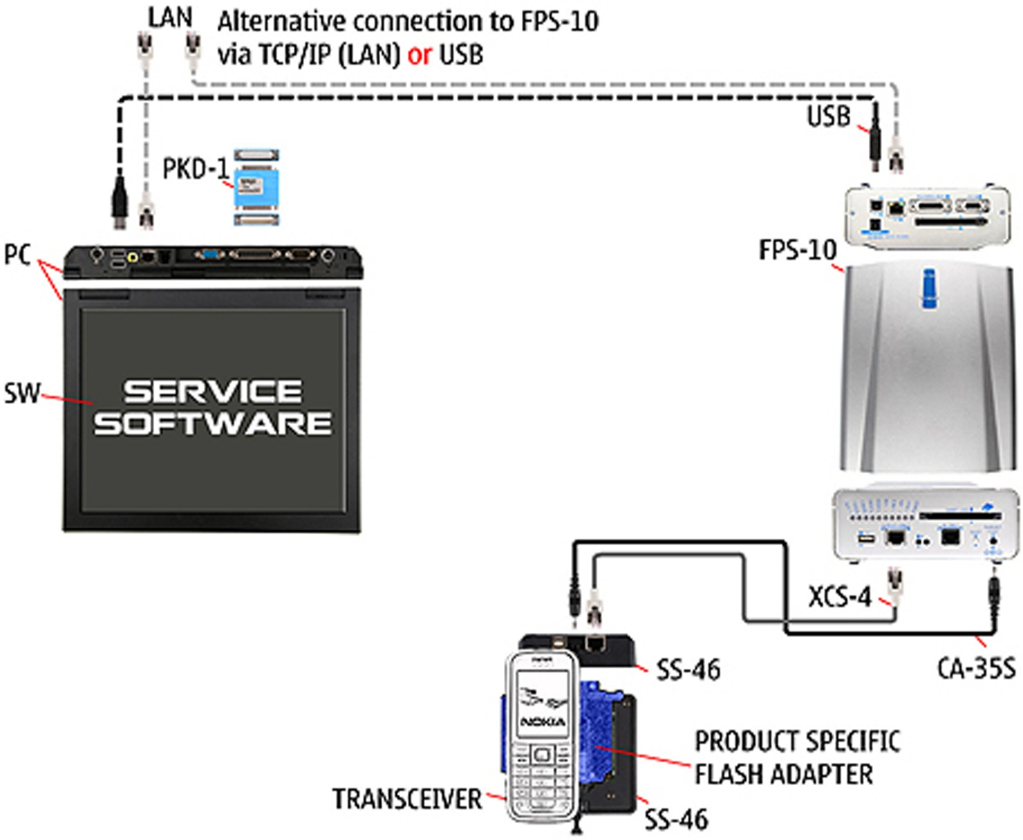

LAN
Alternative connection to FPS-10
via TCP/IP (LAN) or USB
USB
PKD-1
PC
FPS-10
SW
SERVICE
SOFTWARE
XCS-4
SS-46
CA-35S
PRODUCT SPECIFIC
FLASH ADAPTER
TRANSCEIVER
SS-46

Figure 28 Basic flash concept with FPS-10

Type	Description
SS-46	Interface adapter
FS-10	Flash adapter
CA-35S	Power cable
XCS-4	Modular cable

Type	Description
FPS-10	Flash prommer box
	USB cable
PKD-1	SW security device

MJ-111 module jig concept

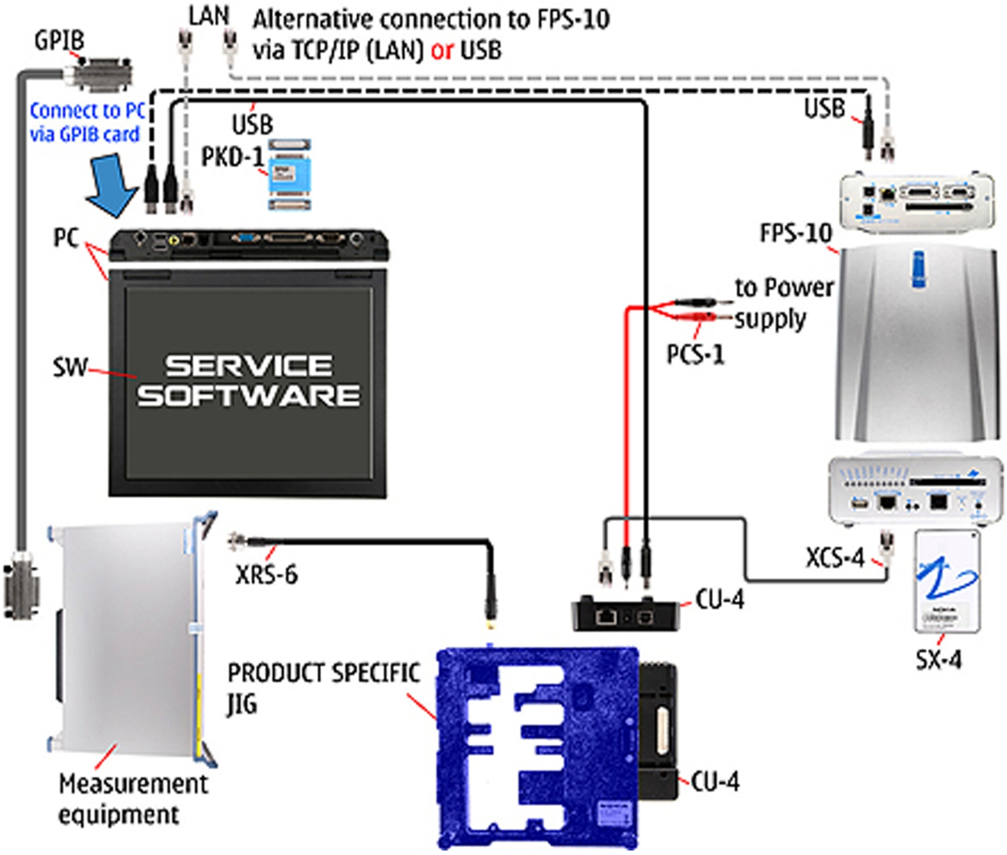

LAN
Alternative connection to FPS-10
via TCP/IP (LAN) or USB
GPIB
Connect to PC
via GPIB card
USB
PKD-1
USB
PC
FPS-10
to Power
supply
PCS-1
SW
SERVICE
SOFTWARE
XRS-6
XCS-4
CU-4
SX-4
PRODUCT SPECIFIC
JIG
Measurement
equipment
CU-4

Figure 29 MJ-111 module jig service concept

Type	Description
MJ-111	Module jig
CU-4	Control unit
FPS-10	Flash prommer box
SX-4	Smart card
XCS-4	Modular cable
PCS-1	DC power cable
	USB cable
	USB cable
	GPIB control cable
XRS-6	RF cable

Type	Description
PKD-1	SW security device
	Measurement equipment

POS (Point of Sale) flash concept

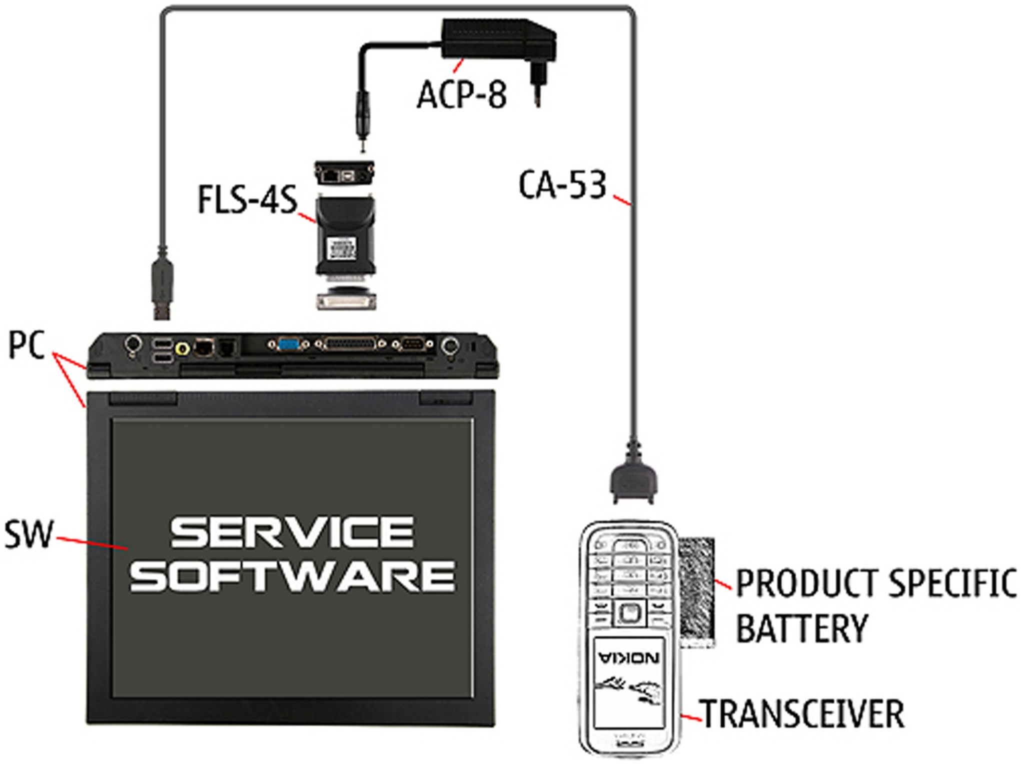

ACP-8
FLS-4S
CA-53
PC
SW
SERVICE SOFTWARE
PRODUCT SPECIFIC BATTERY
TRANSCEIVER

Figure 30 POS flash concept

Type	Description
CA-53	USB connectivity cable
FLS-4S	POS flash dongle
ACP-8	Power adapter
BL-5C	Battery

Service concept for RF testing and RF/BB tuning

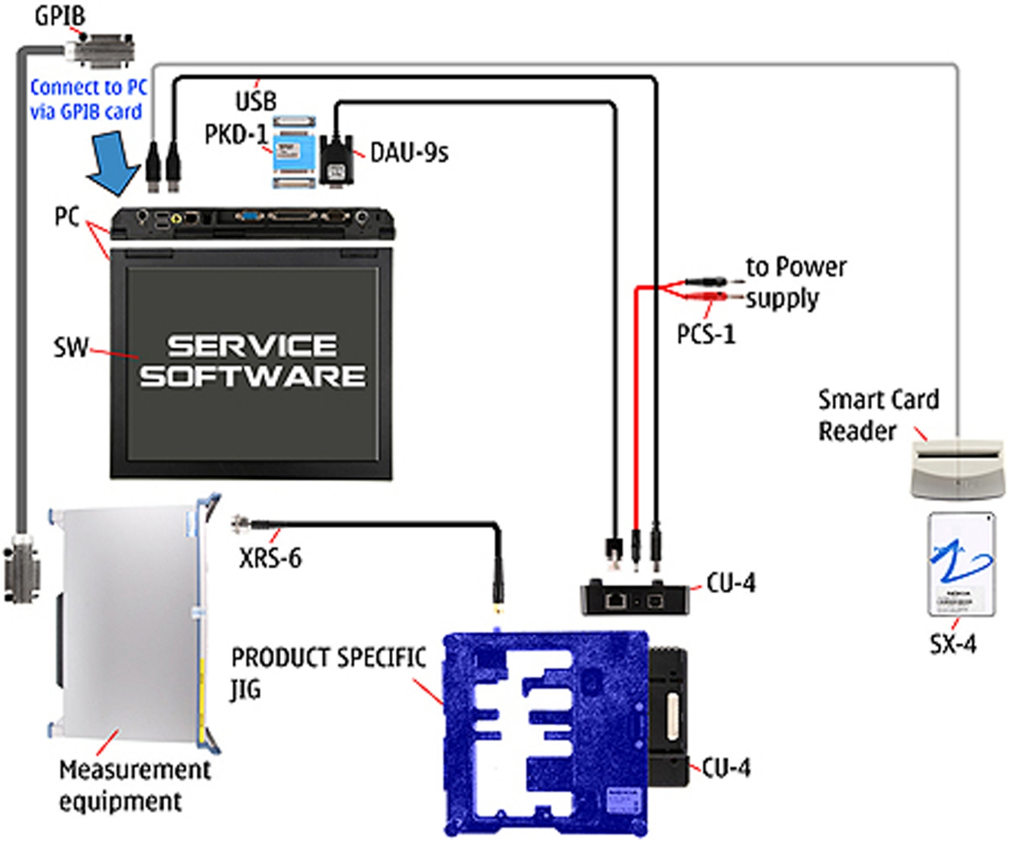

GPIB
Connect to PC via GPIB card
USB
PKD-1
DAU-9s
PC
SW
SERVICE SOFTWARE
to Power supply
PCS-1
Smart Card Reader
XRS-6
CU-4
SX-4
PRODUCT SPECIFIC JIG
Measurement equipment
CU-4

Figure 31 Service concept for RF testing and RF/BB tuning

Type	Description
CU-4	Control unit
DAU-9s	MBUS cable
PCS-1	DC power cable
	USB cable
MJ-111	Module jig
SX-4	Smart card
	Standard USB cable + Smart card reader
XRS-6	RF cable
	Measurement equipment
PKD-1	SW security device
	GPIB control cable

CU-4 flash concept with FPS-10

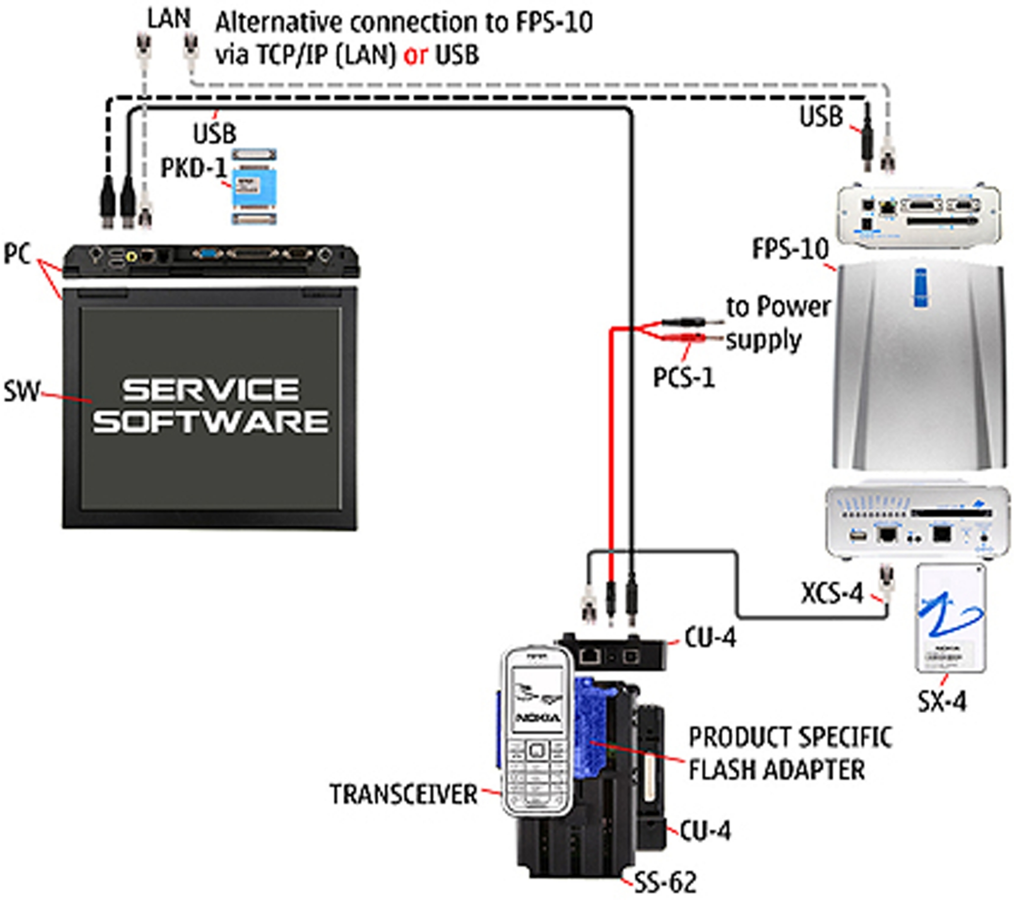

LAN
Alternative connection to FPS-10 via TCP/IP (LAN) or USB
USB
PKD-1
USB
PC
SW
SERVICE SOFTWARE
FPS-10
to Power supply
PCS-1
XCS-4
CU-4
SX-4
PRODUCT SPECIFIC FLASH ADAPTER
TRANSCEIVER
CU-4
SS-62

Figure 32 CU-4 flash concept with FPS-10

Type	Description
CU-4	Control unit
XCS-4	Modular cable
PCS-1	Power cable
	USB cable
FPS-10	Flash prommer box
SX-4	Smart card
	Standard USB cable
SS-62	Module jig
FS-10	Flash adapter
PKD-1	SW security device

RF testing concept with RF coupler

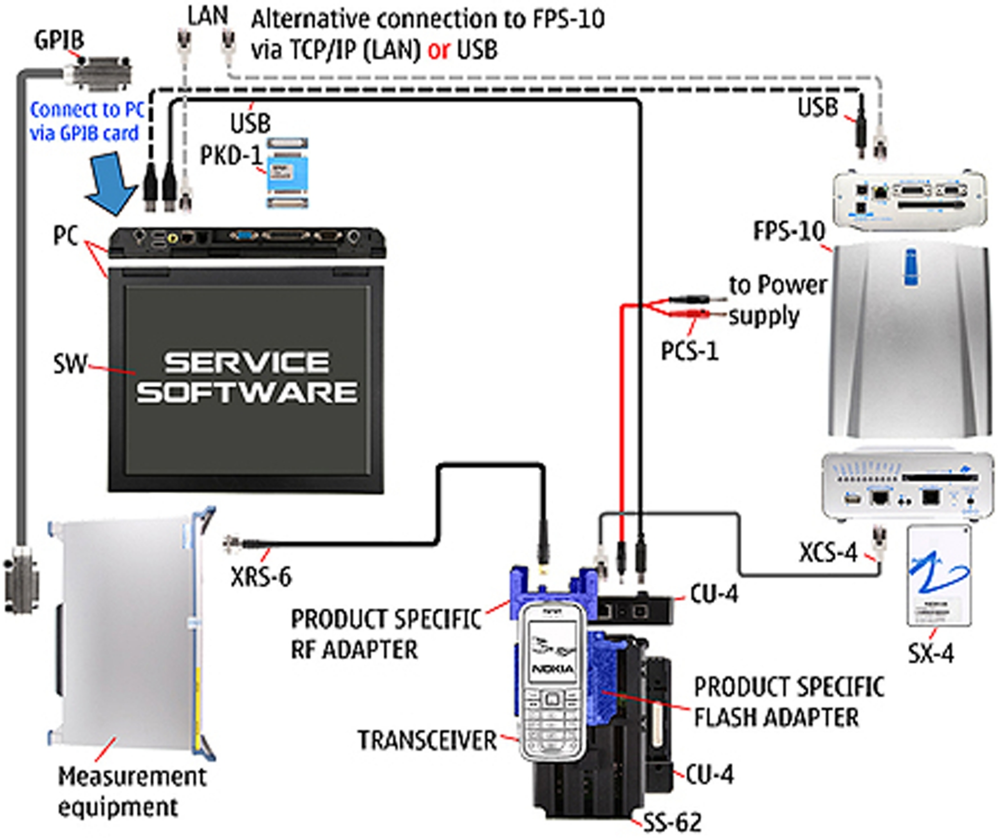

GPIB
LAN
Alternative connection to FPS-10 via TCP/IP (LAN) or USB
Connect to PC via GPIB card
USB
PKD-1
USB
FPS-10
PC
to Power supply
PCS-1
SW
SERVICE SOFTWARE
XRS-6
PRODUCT SPECIFIC RF ADAPTER
XCS-4
CU-4
SX-4
PRODUCT SPECIFIC FLASH ADAPTER
TRANSCEIVER
CU-4
Measurement equipment
SS-62

Figure 33 RF testing concept with RF coupler

Type	Description
CU-4	Control unit
XCS-4	Modular cable
PCS-1	Power cable
	USB cable
SX-4	Smart card
FPS-10	Flash prommer box
	USB cable
SS-62	Module jig
FS-10	Flash adapter
SA-87	RF coupler
XRS-6	RF cable
	Measurement equipment
	GPIB control cable
PKD-1	SW security device

5 — Disassembly / Reassembly Instructions

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Upper block assembly......5–10
Lower block disassembly......5–18
Lower block assembly......5–22

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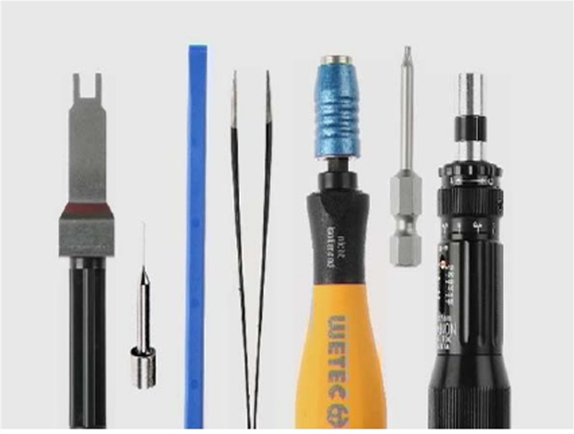
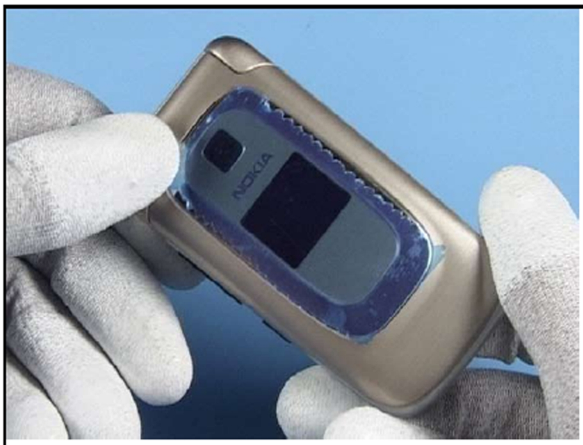
Upper block disassembly



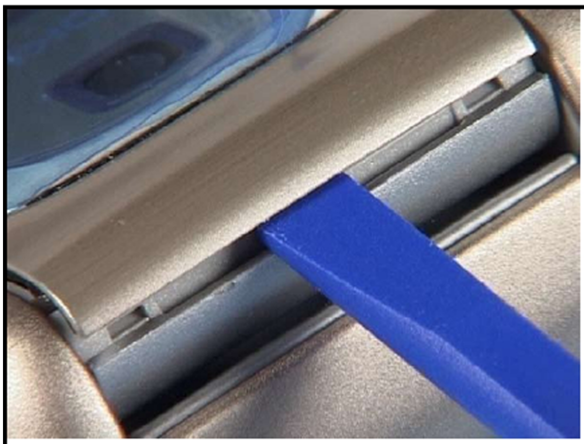
1. Needed tools: SS-88 camera removal tool, the SS-6, the SS-93, metal tweezers, a bit holder with a Torx Plus size 6 bit, a torque driver...

2. ... and the SS-104 for fitting the adhesives and displays.

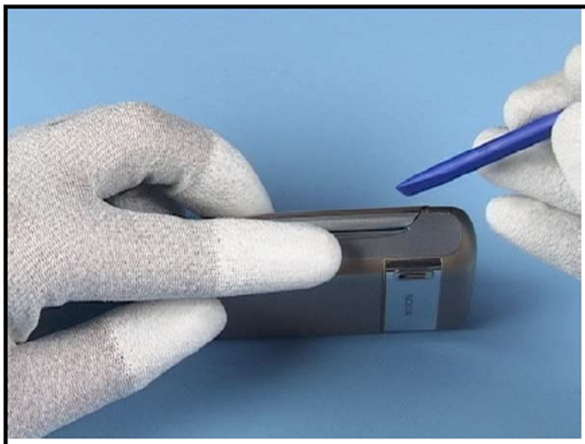


3. Always cover the windows with a protective film.

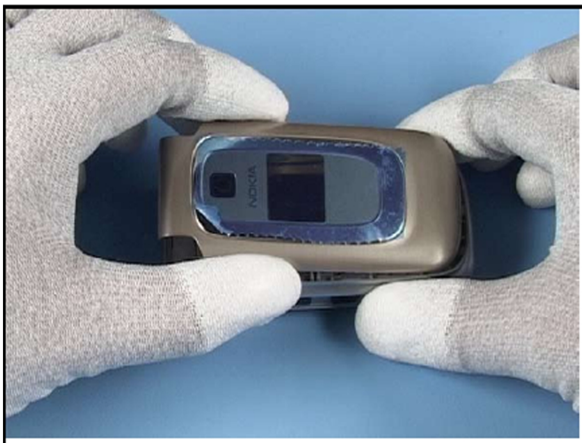
4. Remove the battery if it is still inserted.



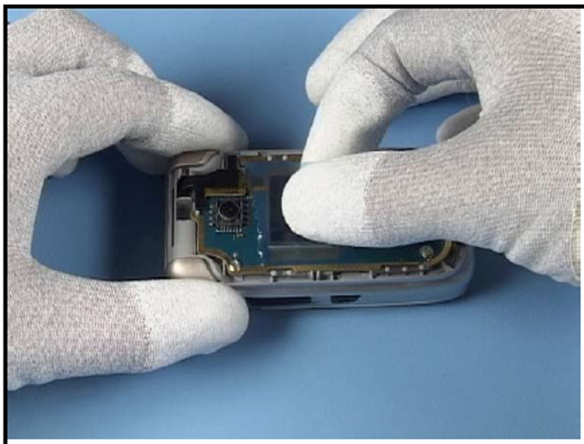
5. Use the SRT-6 to pry open the B-COVER UPPER ASSEMBLY, starting at the top.



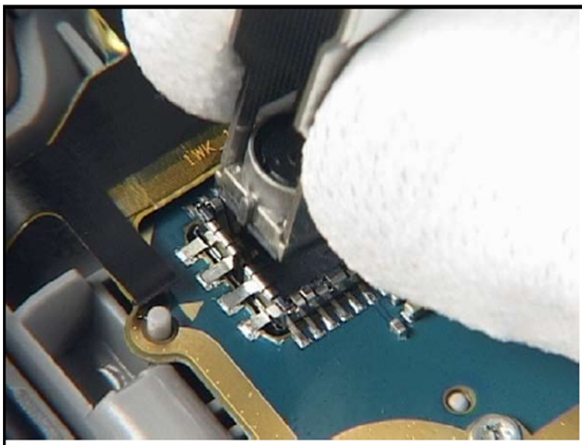
6. Release the clips shown, on both sides.



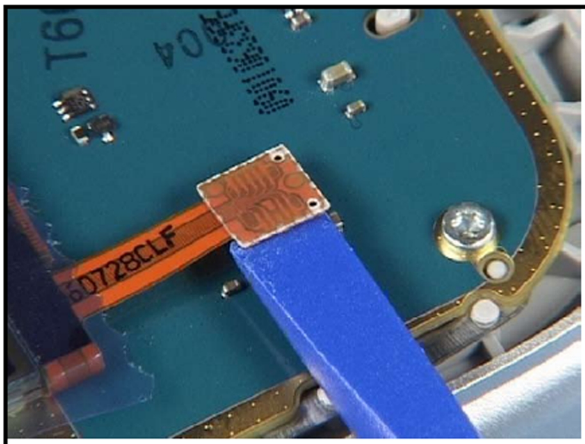
7. Shift the A-Cover to the hinge direction and lift it up.



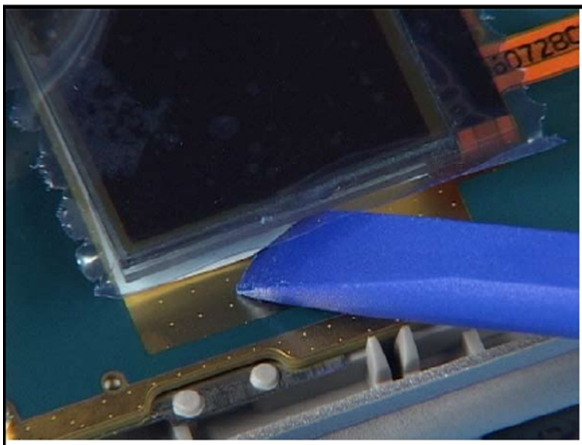
8. Cover the LCD PM with a protective film.



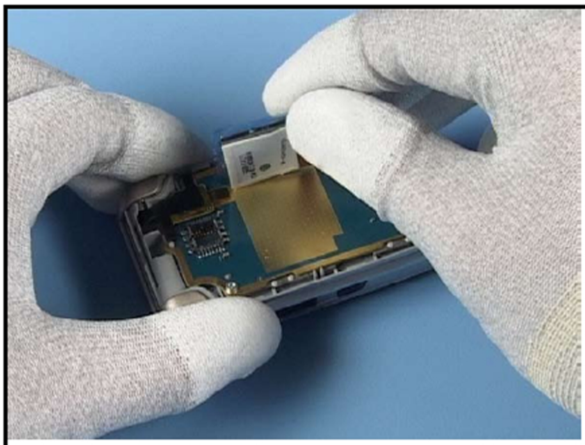
9. Carefully release and remove the CAMERA MODULE with the SS-88 Camera removal tool.



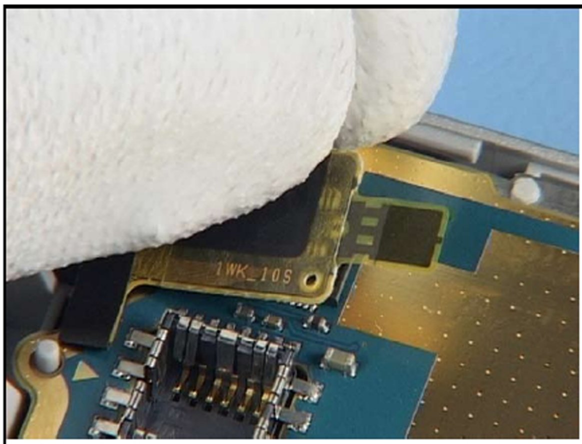
10. Disconnect the flex connector.



11. Carefully release the adhesive of the LCD PM with the SS-93.



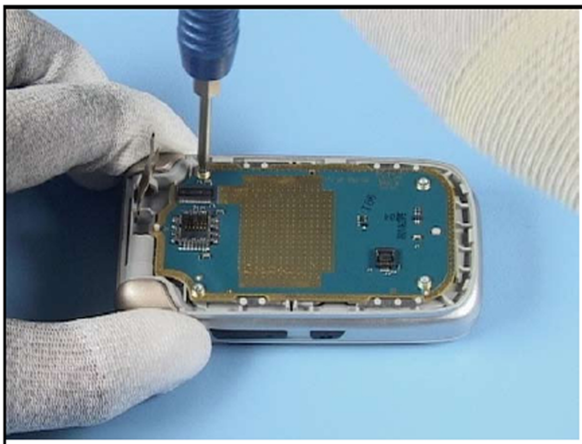
12. Remove the LCD PM.



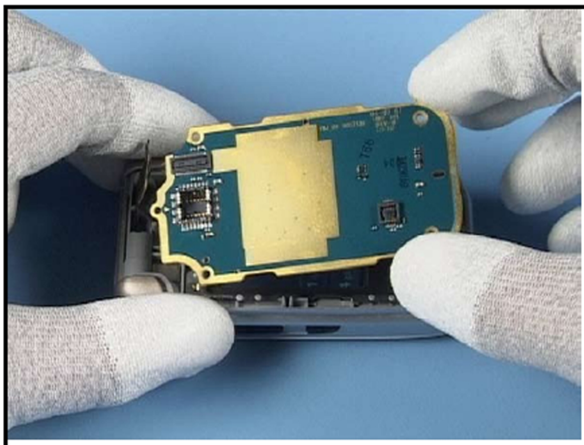
13. Disconnect the flex connector.

6IP TORX-PLUS
Wera
8671

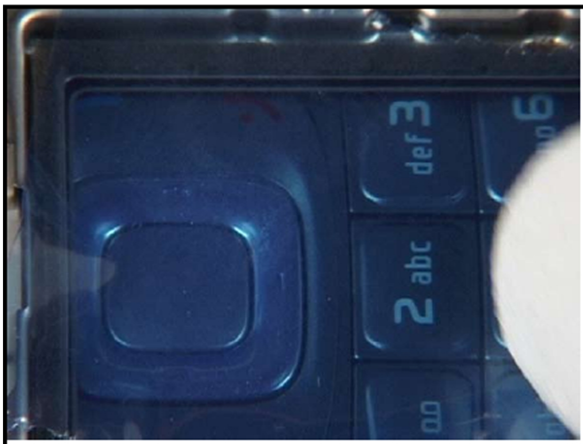
14. Fit the Torx Plus size 6 bit.



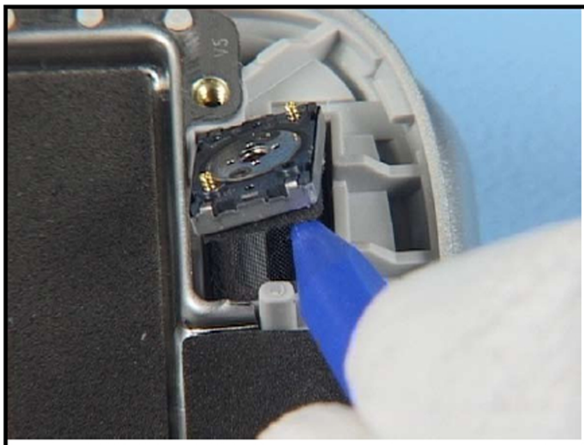
15. Unscrew the four screws and remove them.



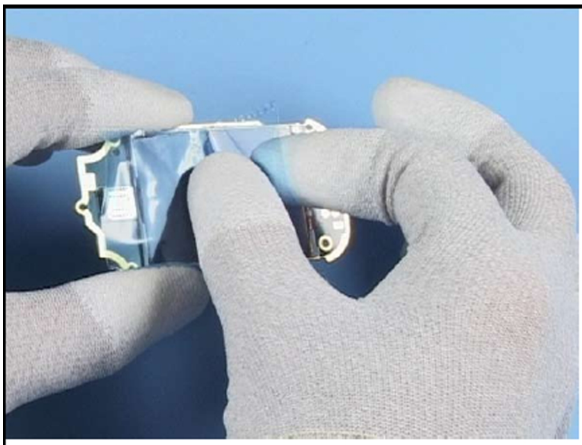
16. Lift out the PWB 1WJ.



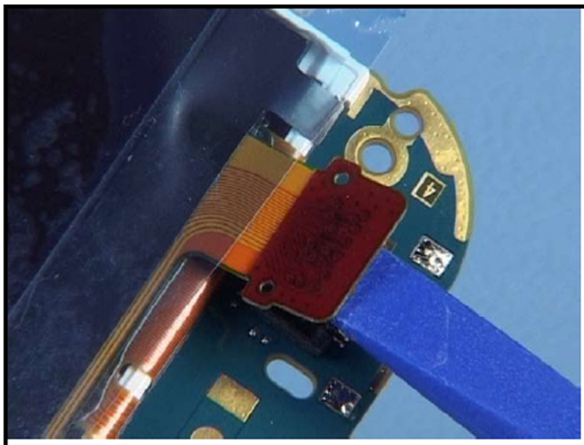
17. Cover the innerside window with a plastic film.



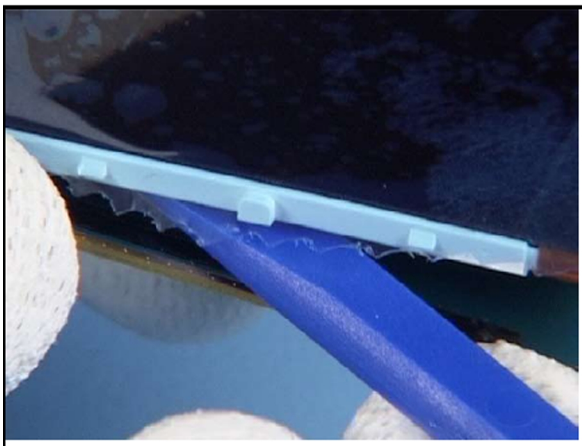
18. Carefully lift out the EARPIECE. Note that the Speaker Gasket will be destroyed during the removal, and must be replaced when reassemble.



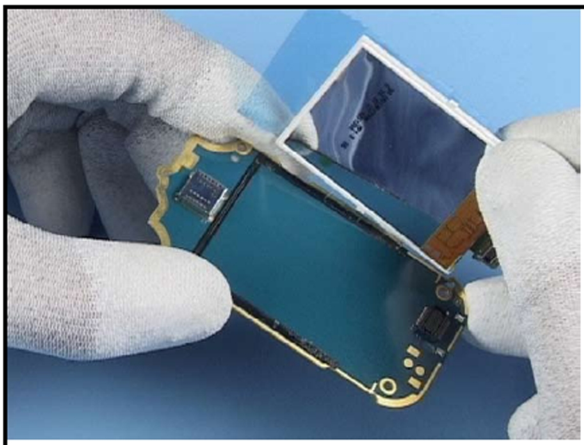
19. Cover the display with a plastic film.



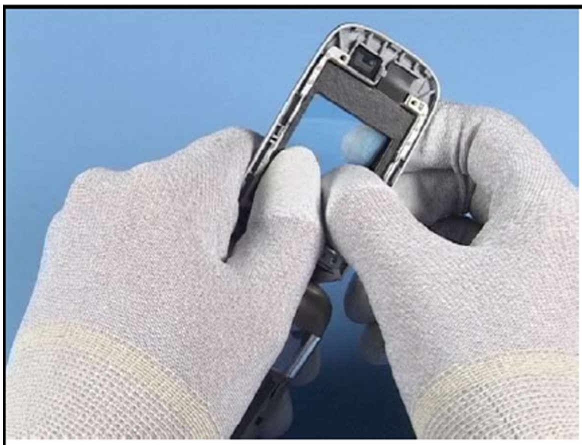
20. Release the flex connector.



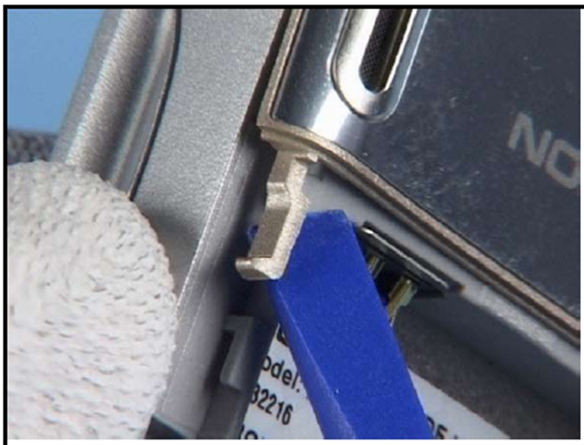
21. Release the LCD BACK ADHESIVE with the SS-93.



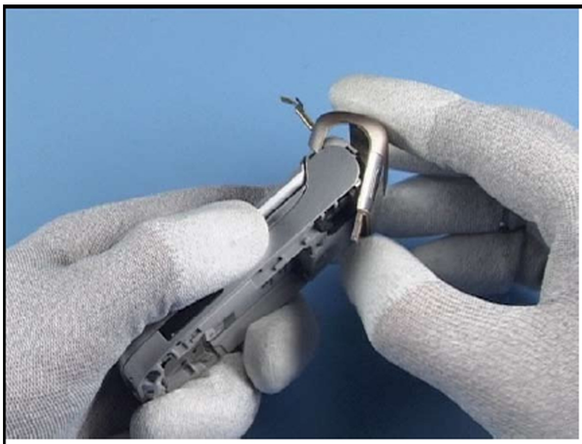
22. Carefully remove the LCD CSDN.



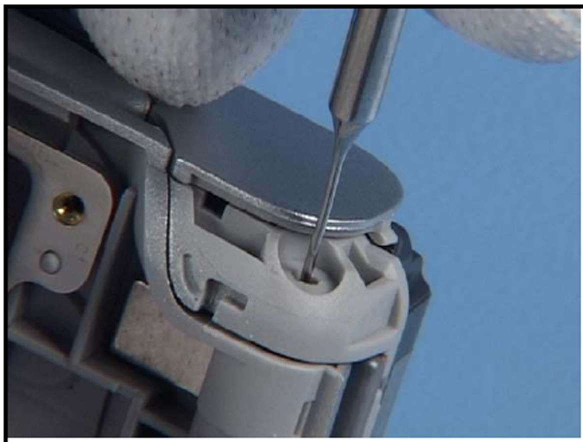
23. Push out the glued in LCD WINDOW.



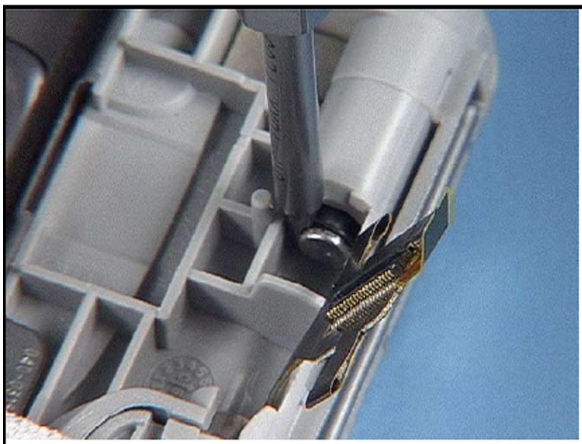
24. Unlock the clips of the ANTENNA CAP.



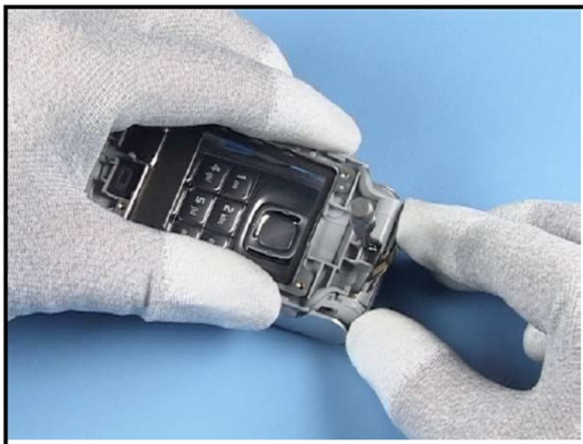
25. Remove the cap as shown.



26. Bend down the hinge module with the SS-6 first. Note that the SS-6 is very delicate and can be break easily.



27. Now lock the HINGE with a torx bit size 6 or similar.

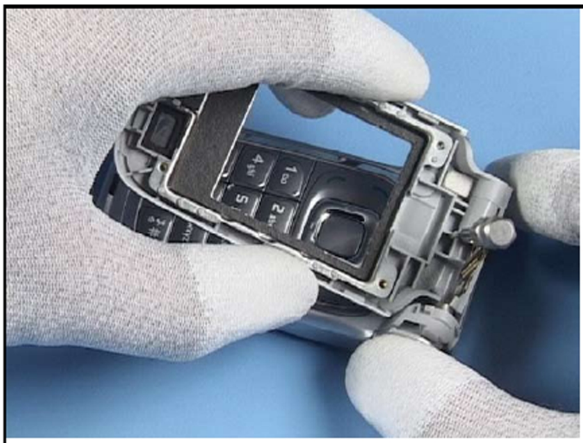


28. Now, the A-COVER UPPER ASSEMBLY can be removed easily. Mind the flex foil. Do not remove the tool, that locks the hinge yet.

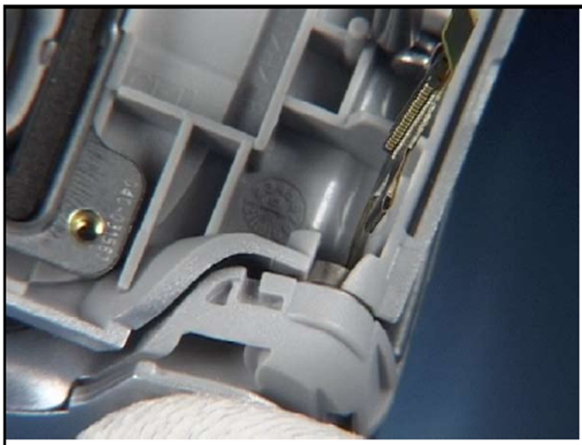
29. The disassembly procedure is now completed

Upper block assembly

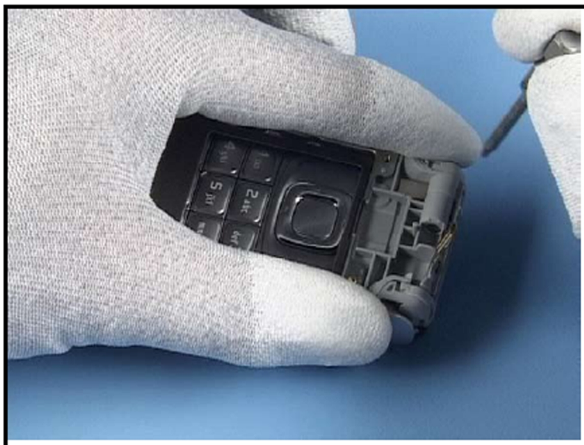
1. Assembly



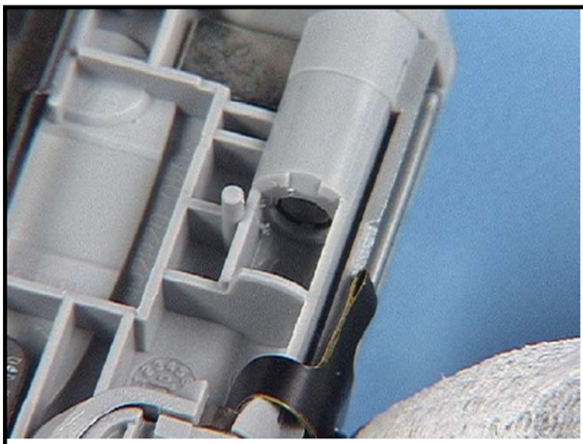
2. Place the A-COVER UPPER ASSEMBLY.



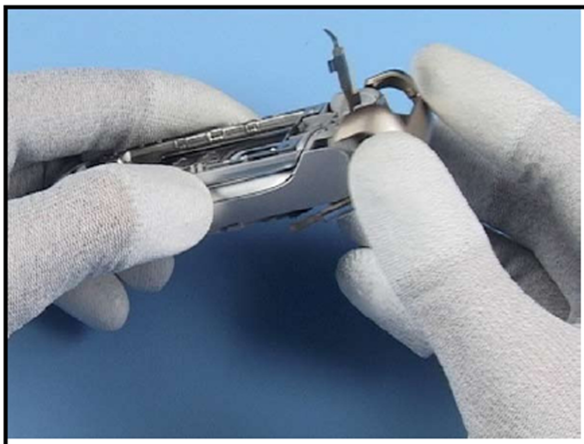
3. Mind the flex foil.



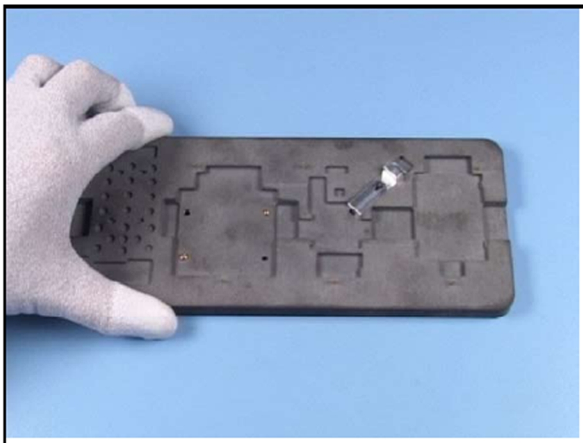
4. Now expand the HINGE MODULE by removing the tool.



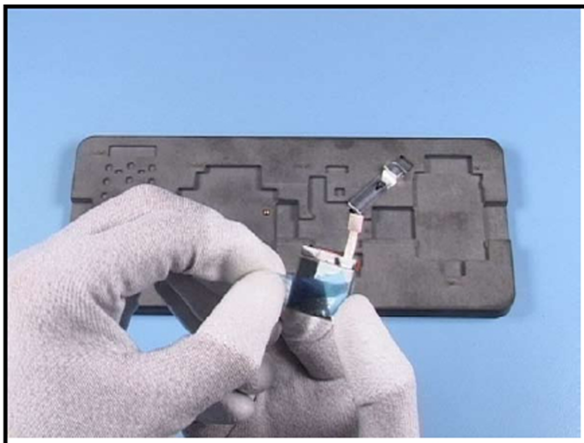
5. Ensure that the hinge expands completely before going on.



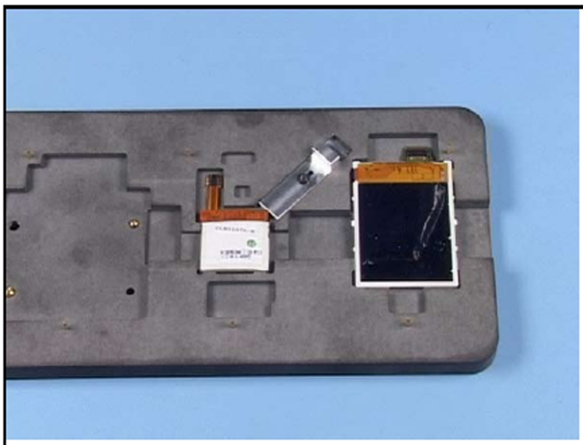
6. Place the ANTENNA CAP and click it into its place.



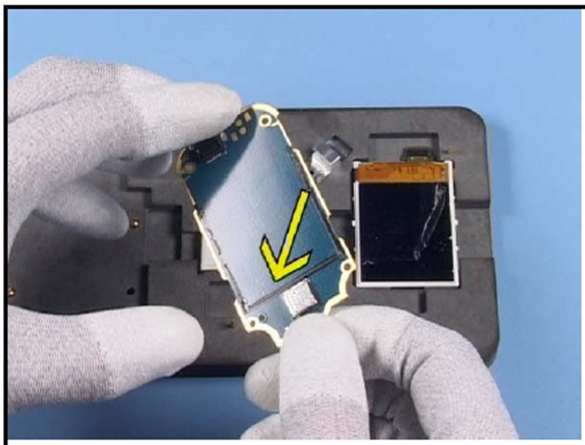
7. Use the SS-104 jig for positioning the displays and gasket correctly.



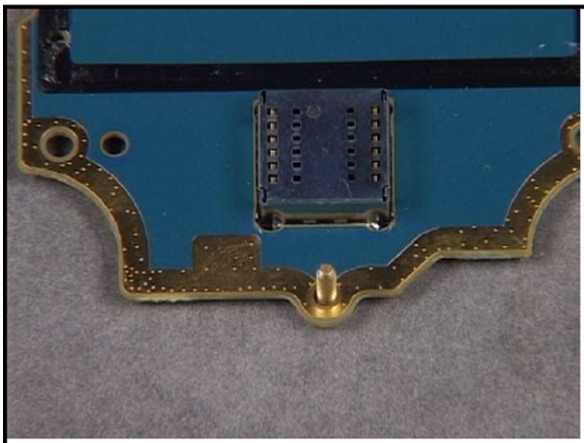
8. Peel up the protective films from the displays



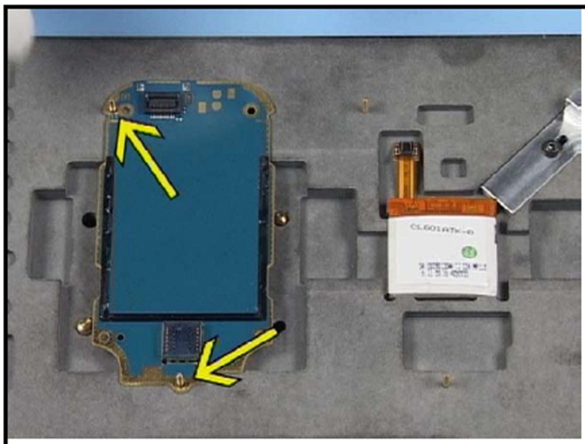
9. Place the displays into their compartments as shown.



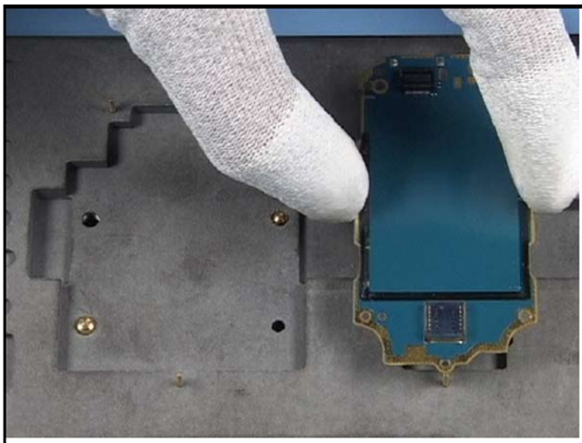
10. Fit new gaskets on the PWB 1WJ for both displays and new adhesives on the PWB.

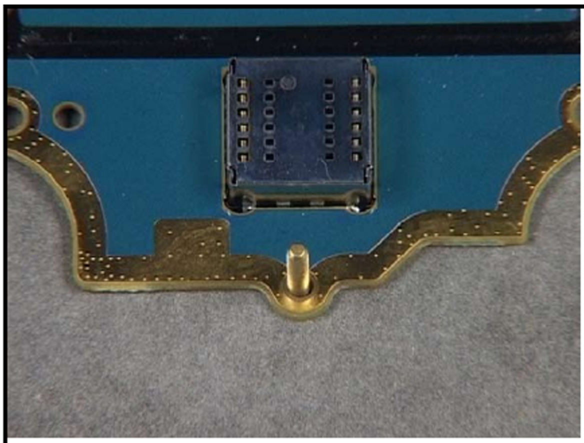


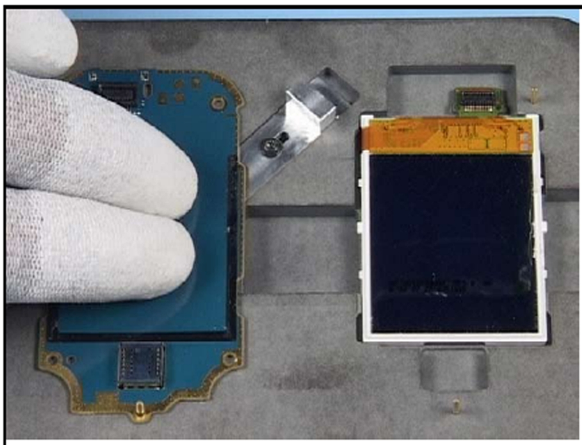
11. Now position the PWB to the guides of the jig.

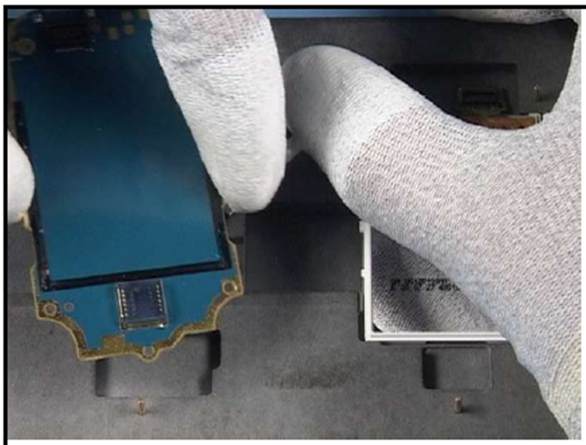


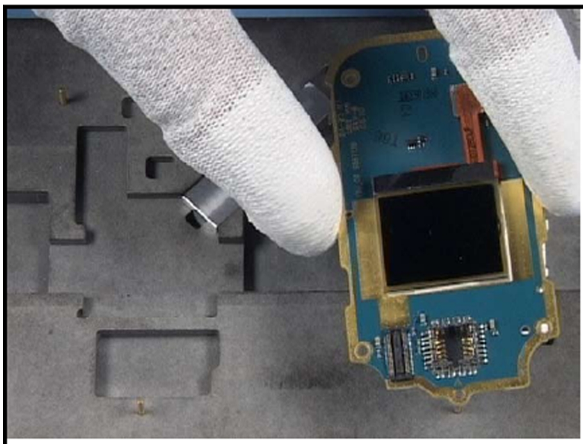
12. Both guides must be fitted correctly.

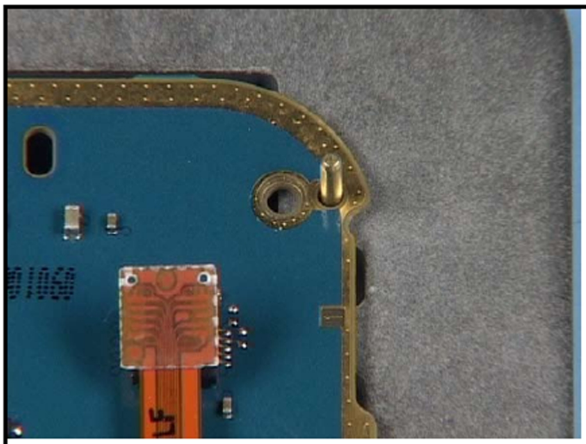

13. Place the PWB over the LCD PM first.

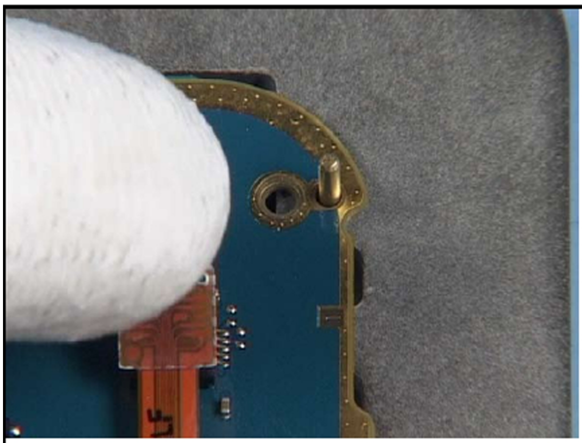

14. Mind the guides.


15. Push it down evenly.

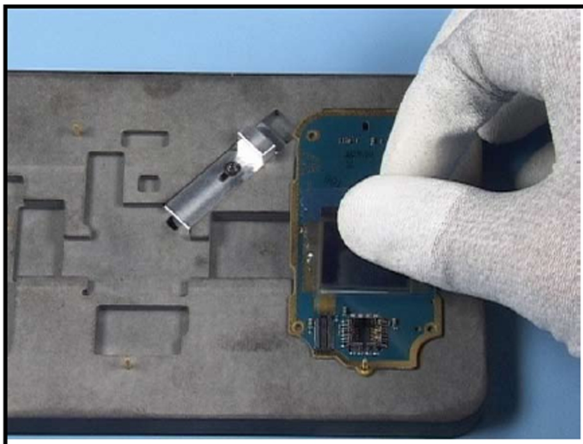

16. Release the lever and remove the PWB.


17. Position the PWB to the LCD CSTN.

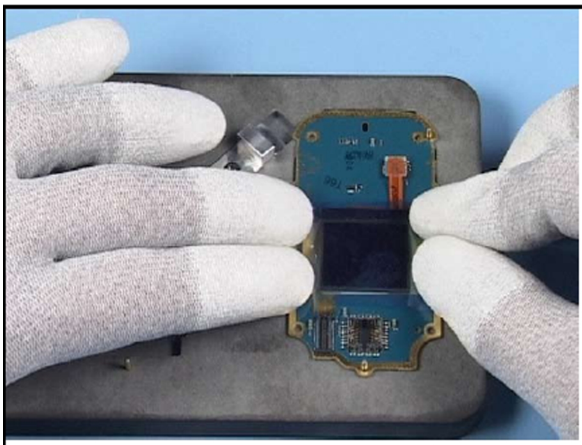

18. Again - mind the guides.



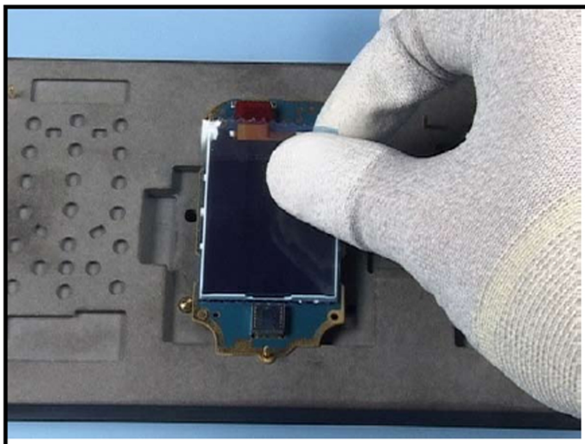
19. Close the flex connector.



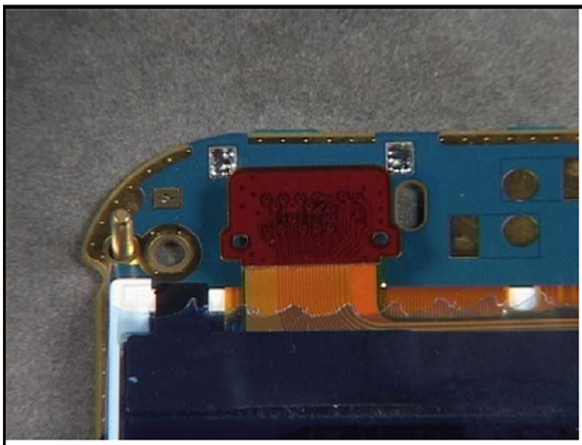
20. Cover the LCD with a protective film.



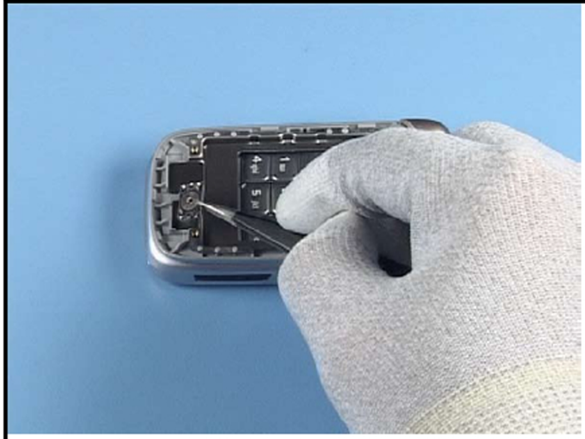
21. Smooth down the PWB evenly.



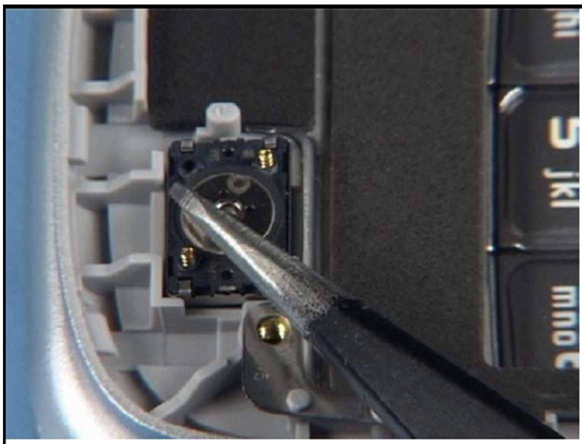
22. Cover the LCD CSTN with a protective film, too.



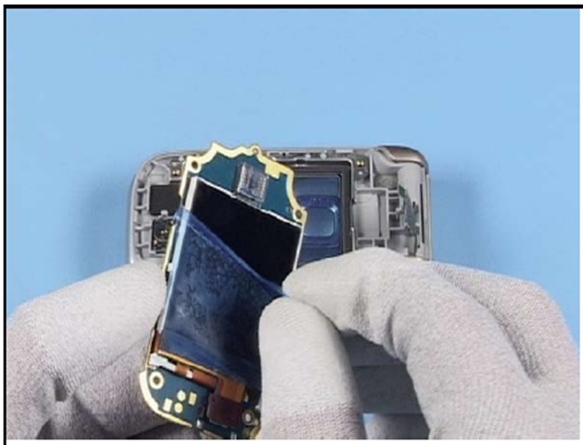
23. Close the flex connector.



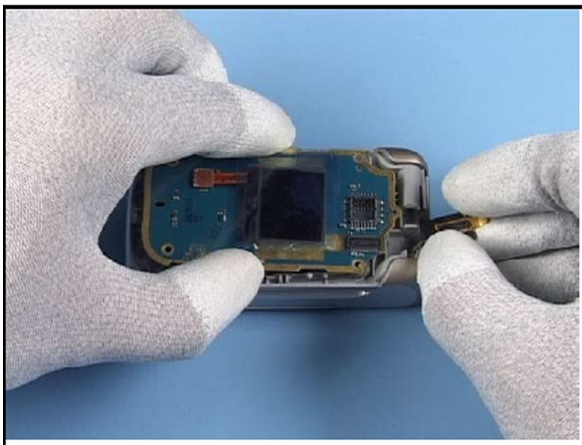
24. Insert the EARPIECE into ist recess. Note that a new speaker gasket must be fitted first.



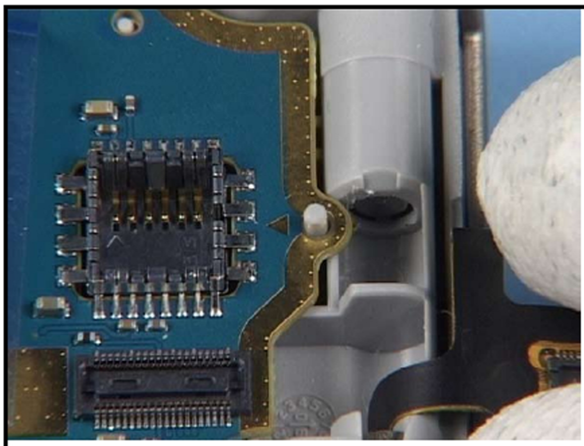
25. Push it down evenly.



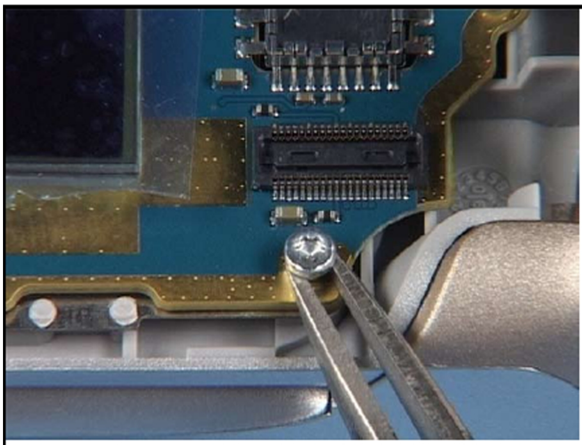
26. Remove the protective film.



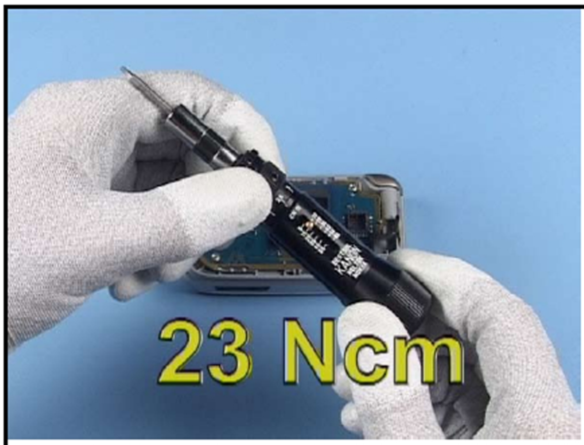
27. Place the PWB into the A-COVER ASSEMBLY.



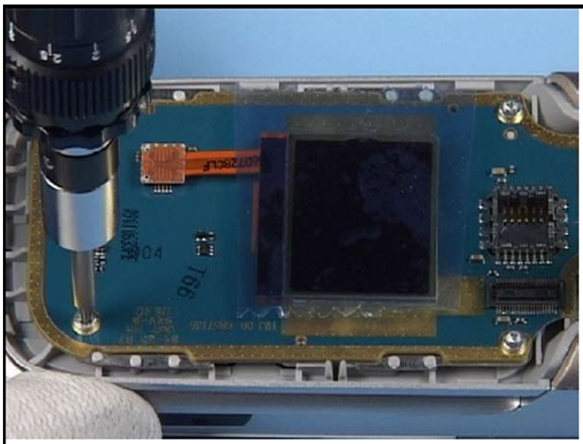
28. Mind the guides.



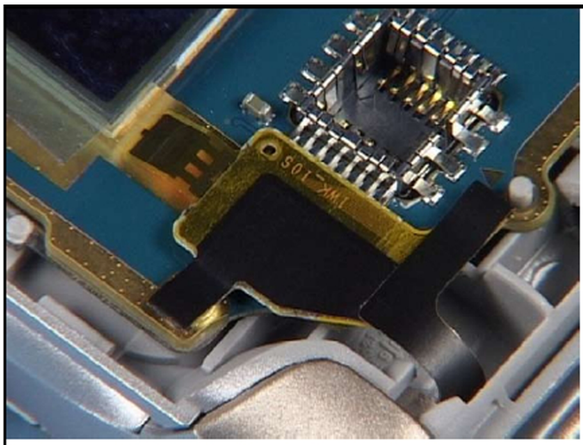
29. Insert the screws.



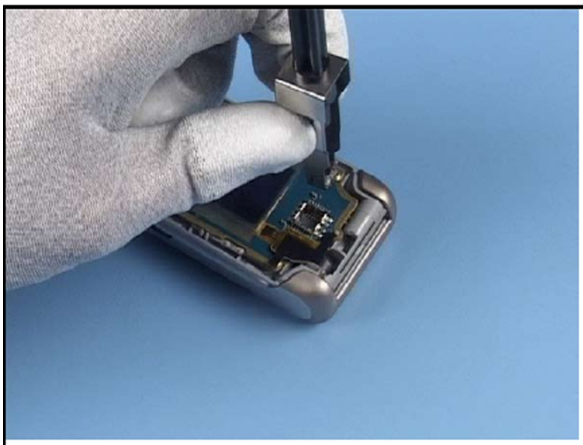
30. Set the correct torque.



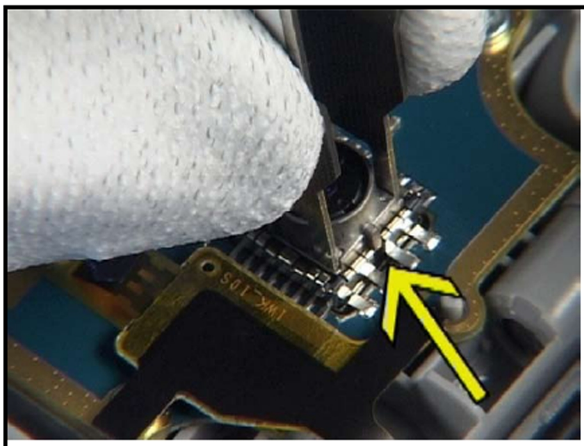
31. Tighten all screws.



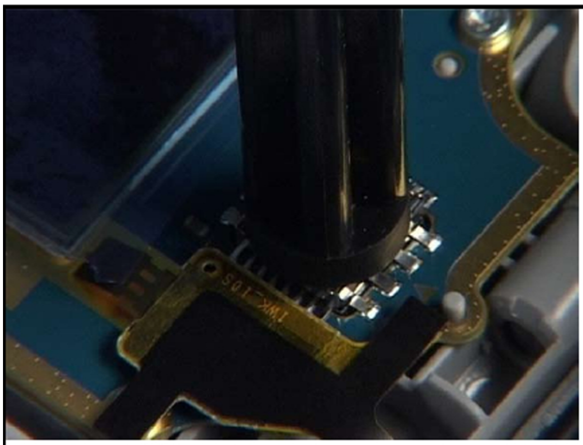
32. Close this connector.



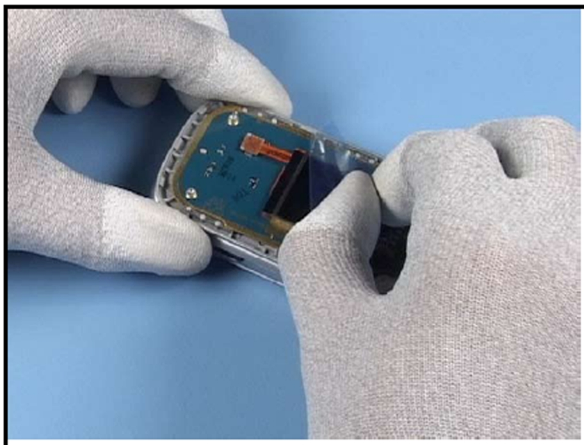
33. Insert the CAMERA MODULE with the SS-88.



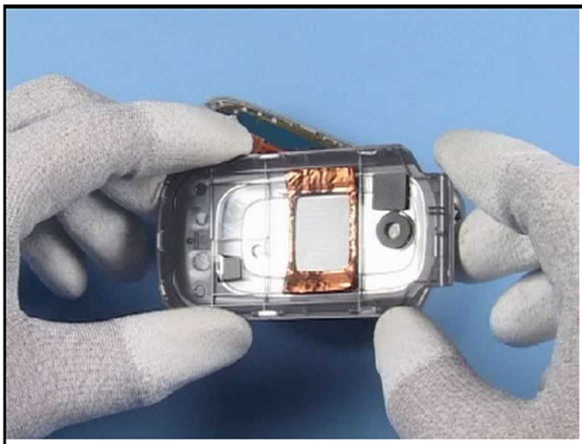
34. Note the alignment tab.



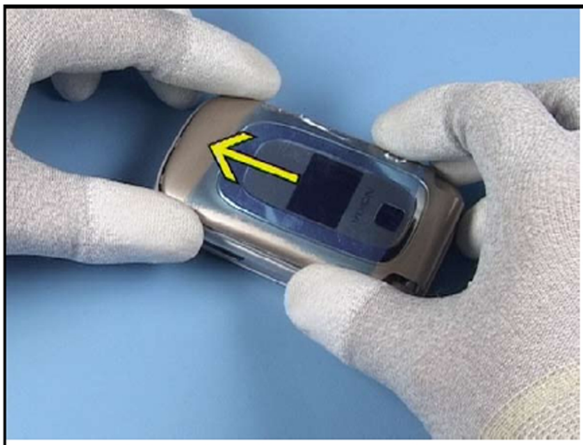
35. Push it down evenly.



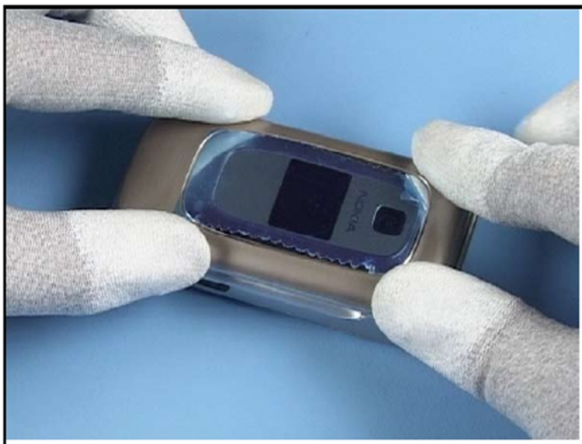
36. Remove the protective film.



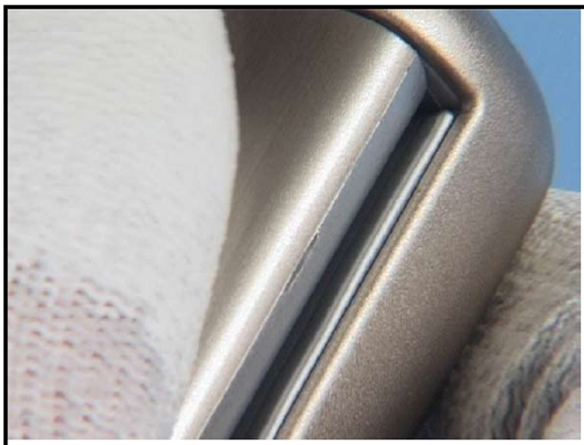
37. Fit a new SECONDARY GASKET to the B-COVER ASSEMBLY if not already done.



38. Place the B-COVER at the shown side first and shift it into the correct position.

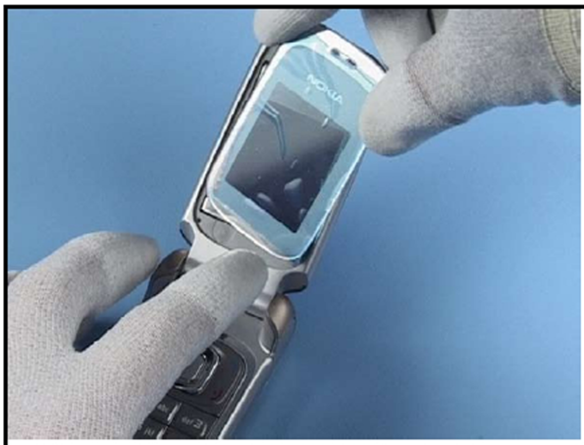


39. Click all snaps into their places.

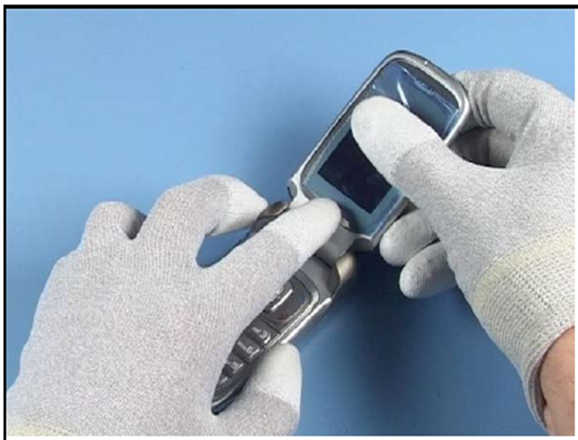


40. Note the correct positioning of the rear clips.

41. Open the unit, check the display and window for cleanness.

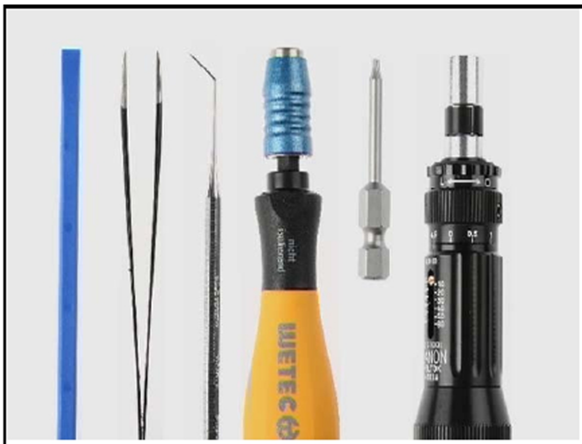


42. Fit the new LCD WINDOW, beginning at the hinge side.



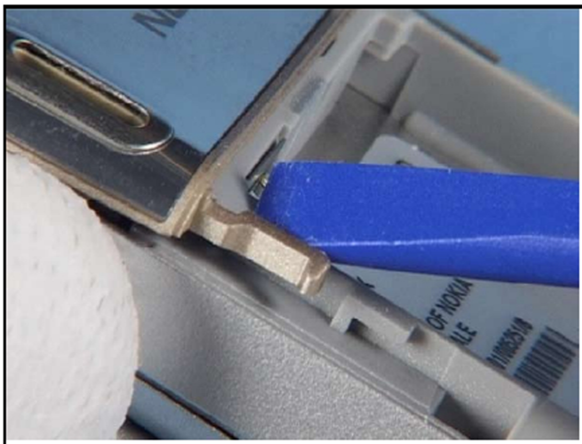
43. Smooth it down evenly.

Lower block disassembly

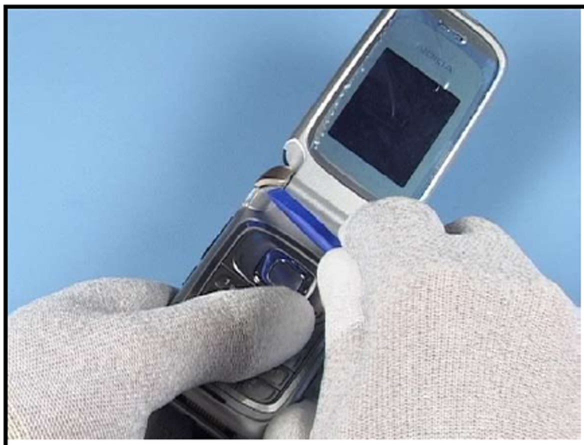


1. Needed tools: The SS-93, metall tweezers, a dental pick, a bitholder, a Torx Plus size 6 bit and a torque driver.

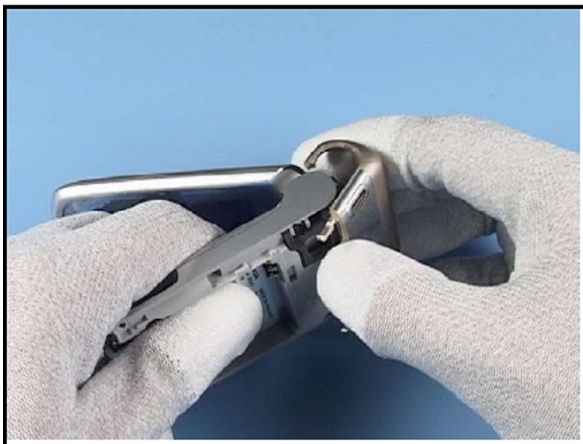
2. Cover the windows with a protective film.



3. Unlock both latches of the ANTENNA COVER.

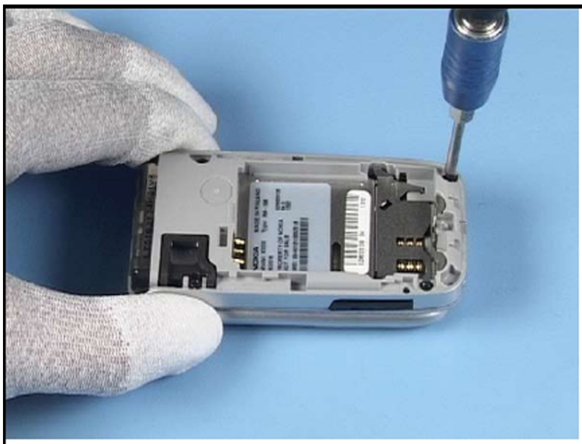


4. Open the assembly, release both upper clips of the ANTENNA COVER.

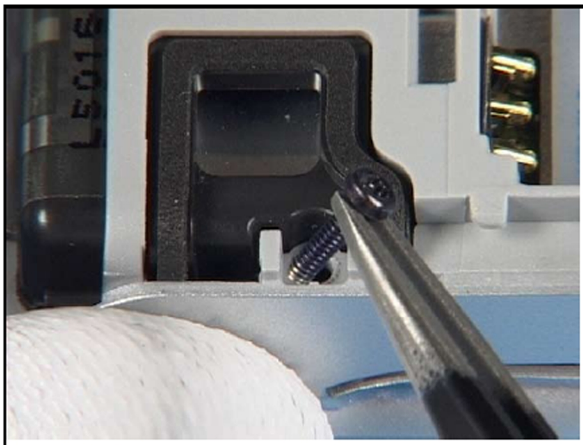


5. Now, the cover can be removed easily.

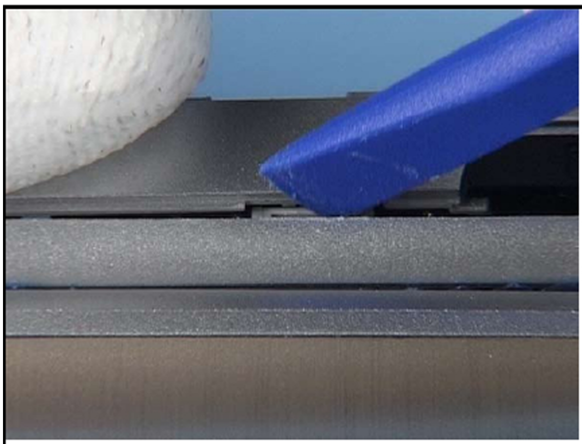
6. Fit the Torx Plus size 6 bit.



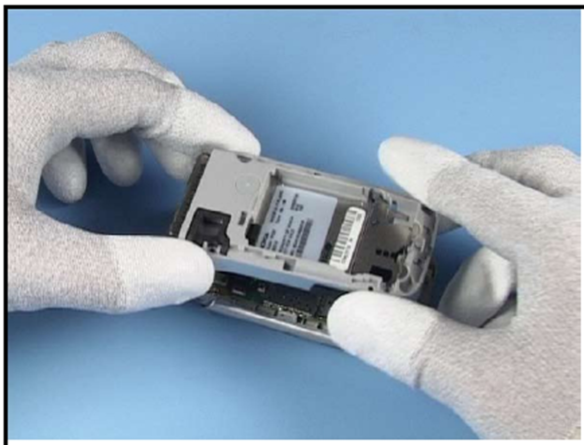
7. Unscrew the four screws.



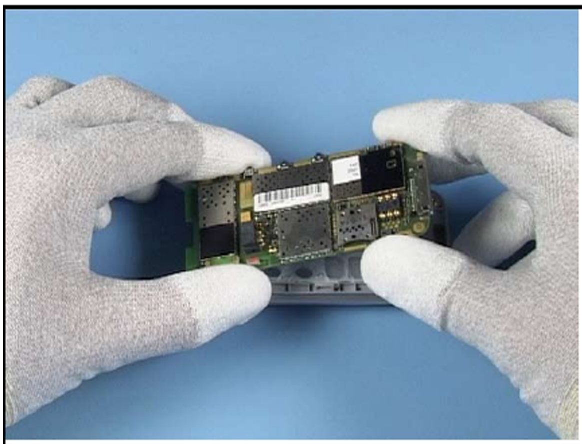
8. Remove the screws.



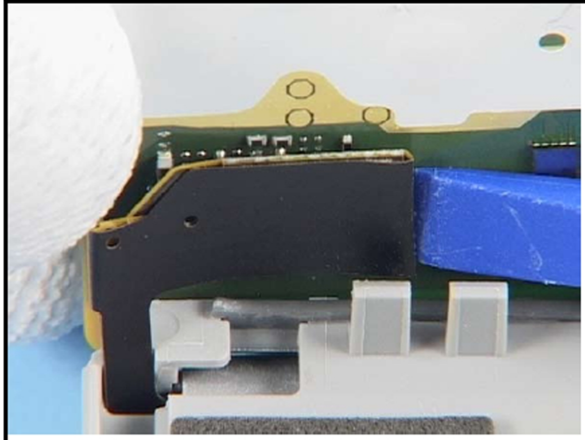
9. Gently pry open the C-COVER with the SS-93.



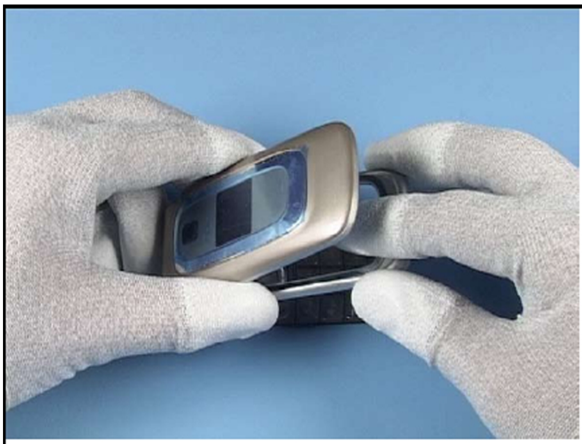
10. Carefully lift up the cover.



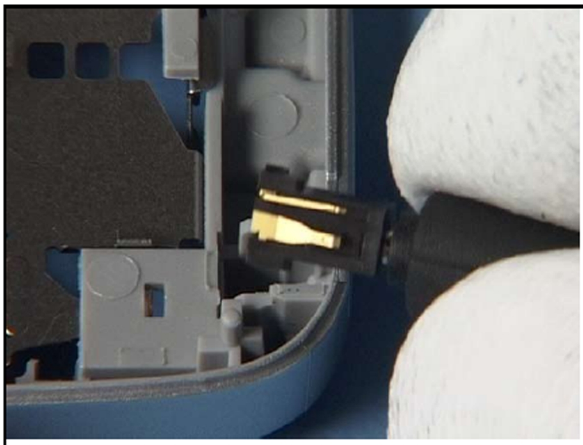
11. Lift up the ENGINE MODULE, keep in mind that the flex foil is still connected.



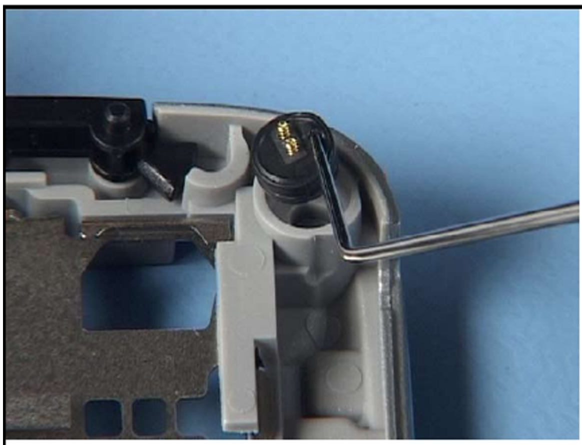
12. Open the connector with the SS-93.



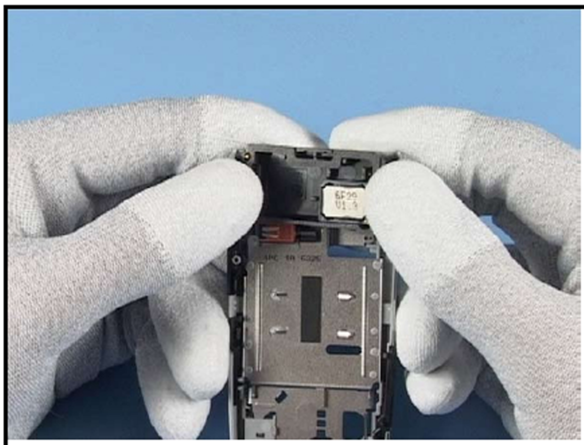
13. Push out the KEYMAT.



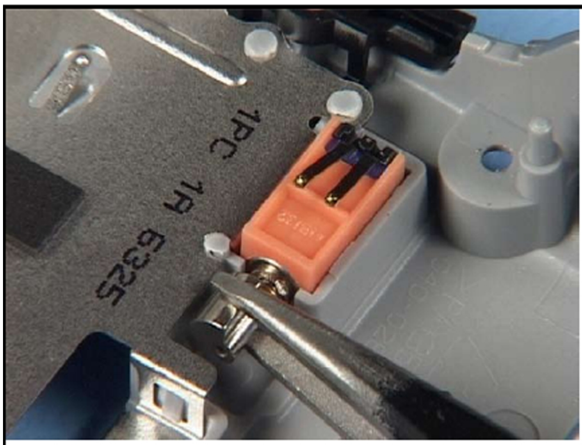
14. Remove the DC JACK with the DC PLUG.



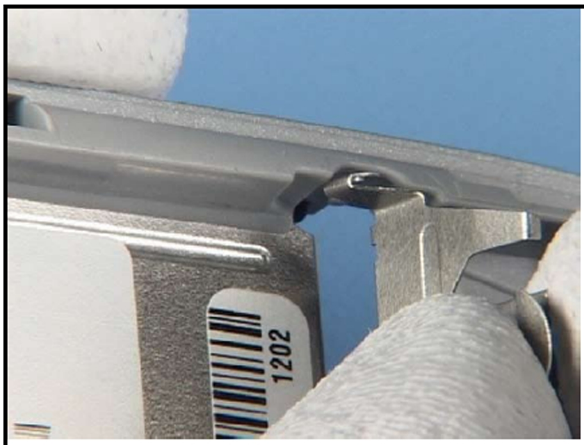
15. Ease the MICROPHONE with the dental pick.



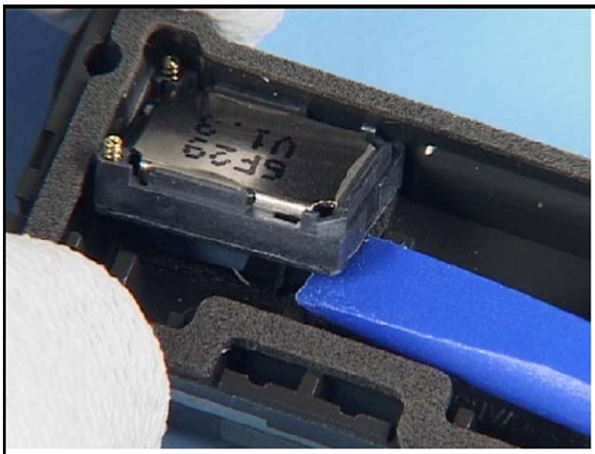
16. Carefully bend the C-COVER as shown to release the clips holding the ANTENNA COVER.



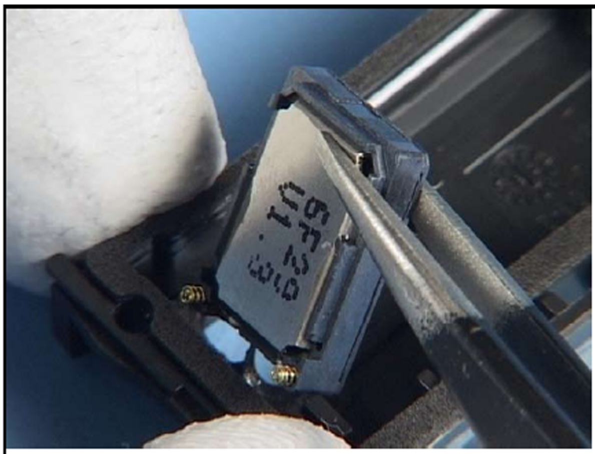
17. Lever out the VIBRA MOTOR.



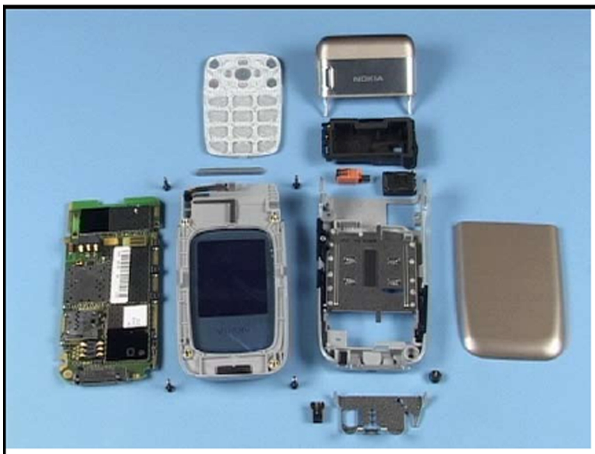
18. Release one clip of the SIM LID and remove it.



19. Lever out the IHF SPEAKER with the SS-93 first.



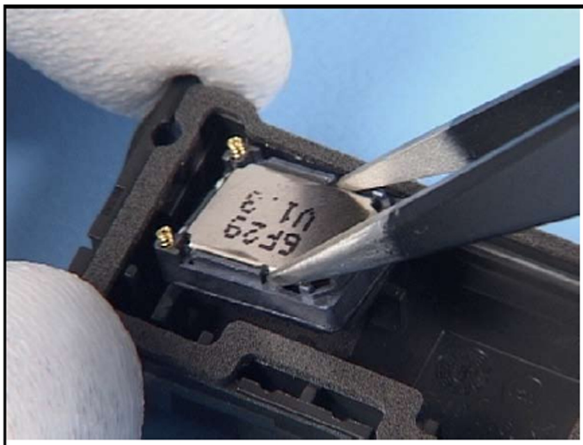
20. Remove it with tweezers now. Bear in mind that the IHF GASKET will be destroyed during the removal and must be renewed when reassembly.



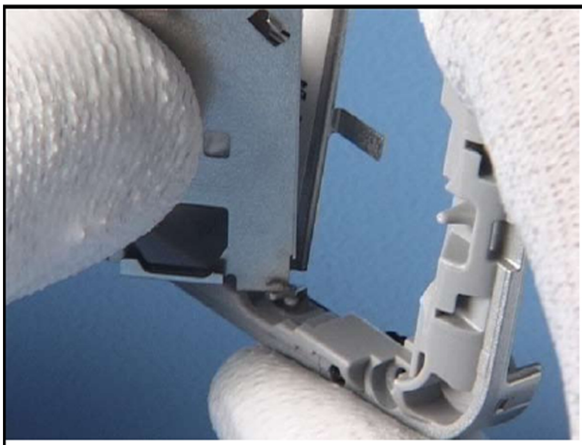
21. The disassembly procedure is now finished.

Lower block assembly

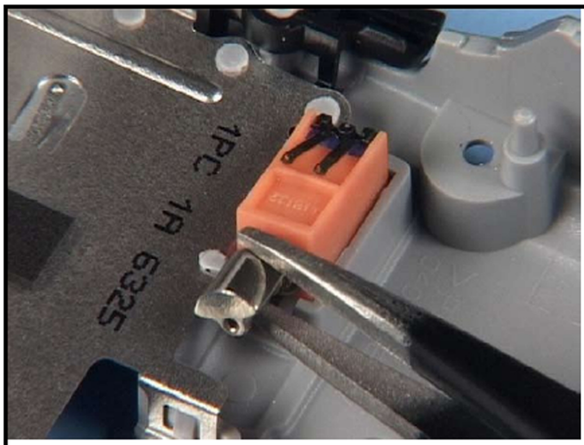
1. Assembly



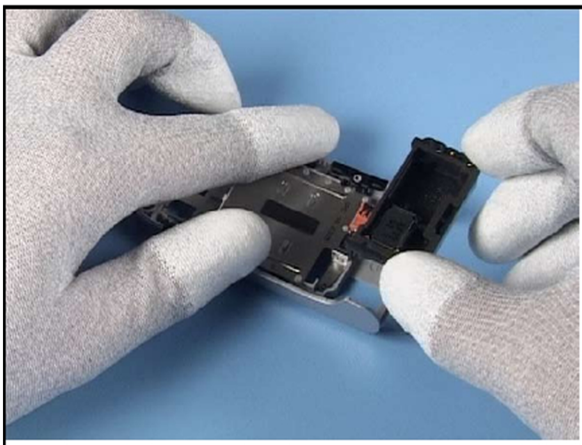
2. Fit a new IHF GASKET and place the IHF SPEAKER into the ANTENNA MODULE. Smooth it down evenly.



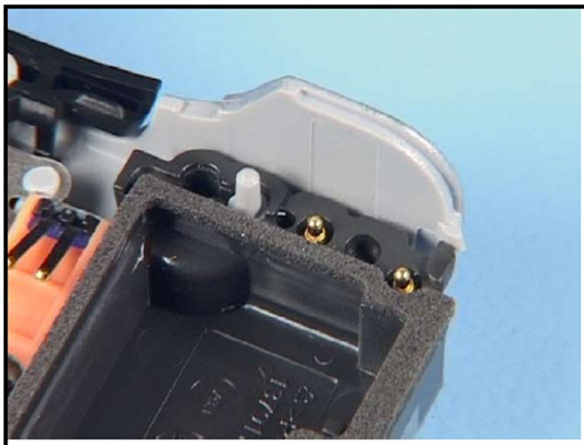
3. Insert the SIM LID and close it.



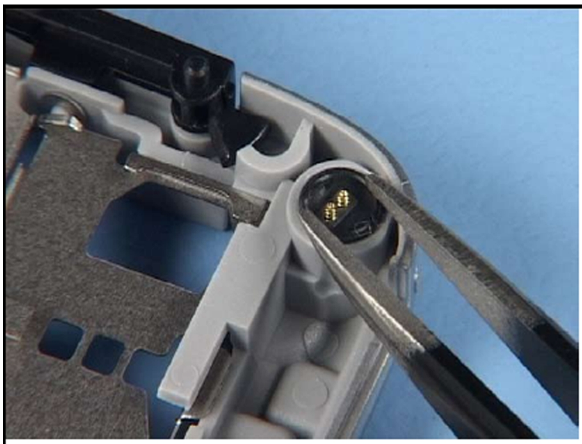
4. Place the VIBRA MOTOR. Do not bend the spring contacts.



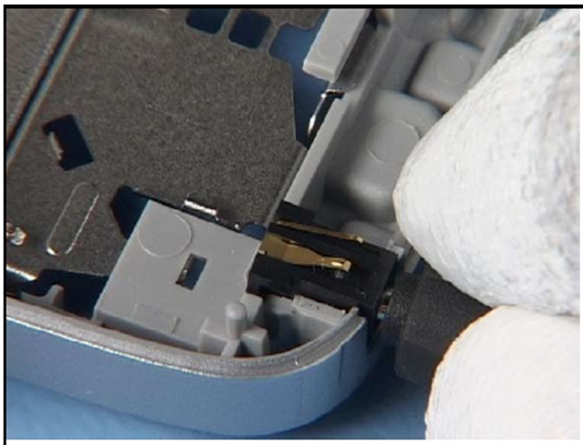
5. Click the ANTENNA MODULE into the C-COVER.



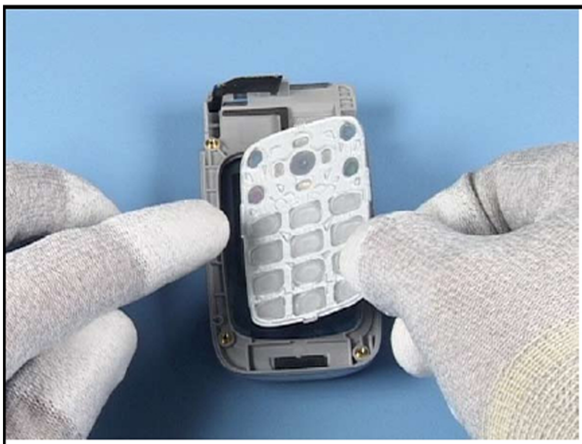
6. Ensure ist correct positioning.



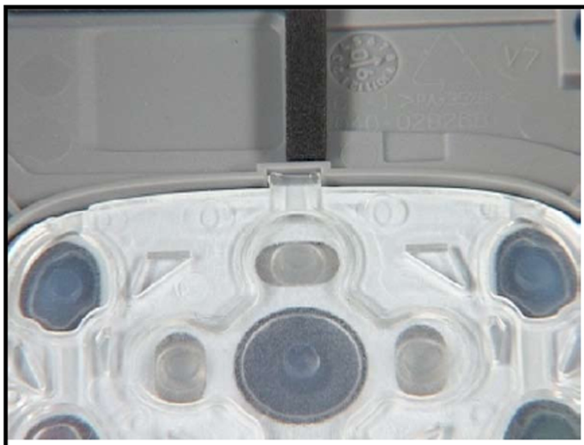
7. Insert the MICROPHONE.



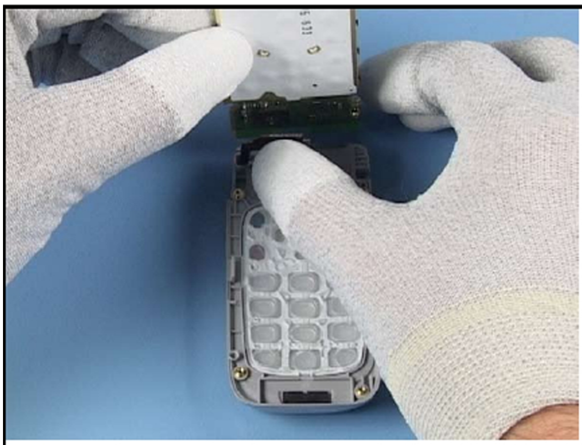
8. And the DC JACK.



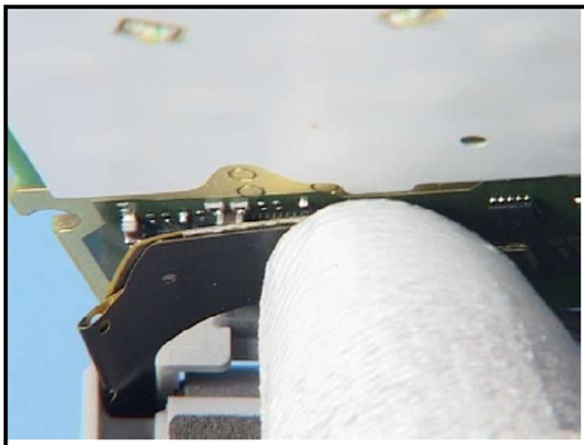
9. Place the KEYMAT.



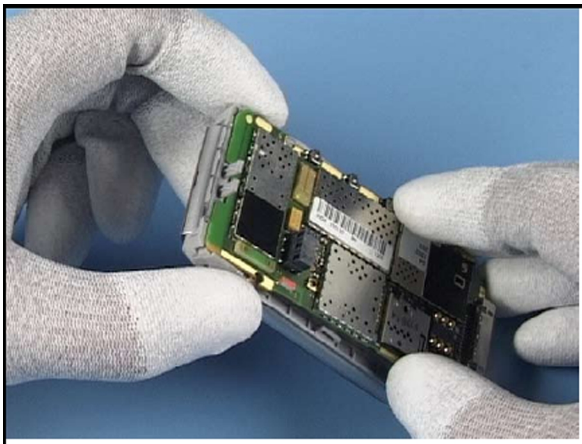
10. Mind the correct positioning.



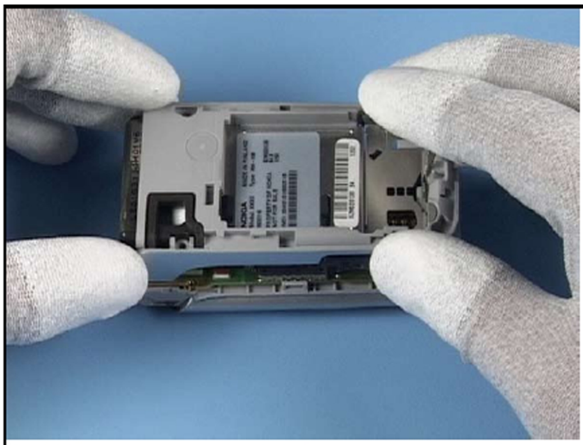
11. Bring the ENGINE MODULE into position near the hinge.



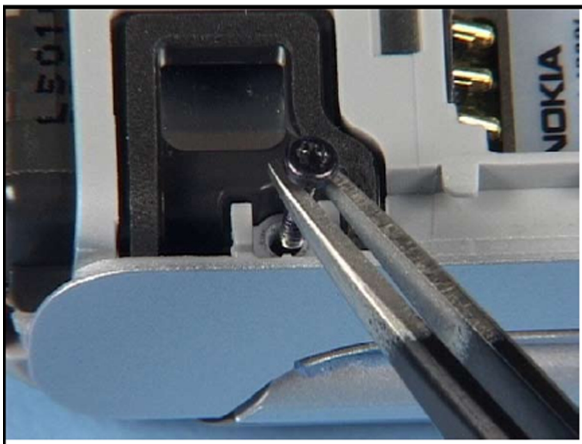
12. Close the flex connector.



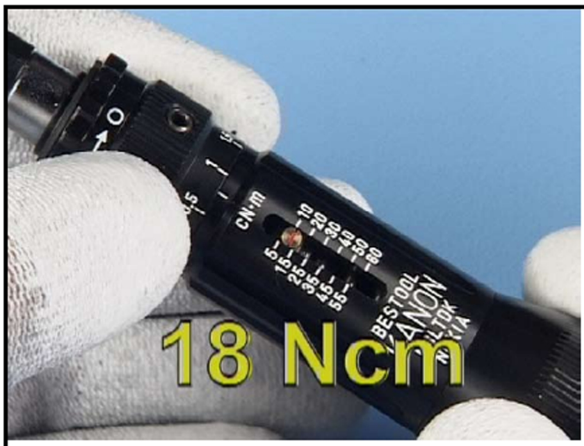
13. Position the ENGINE MODULE into the cover.



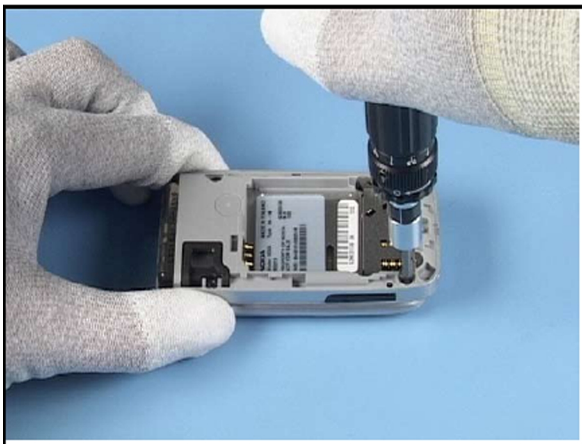
14. Now align the C-COVER above the A-COVER and push it down evenly.



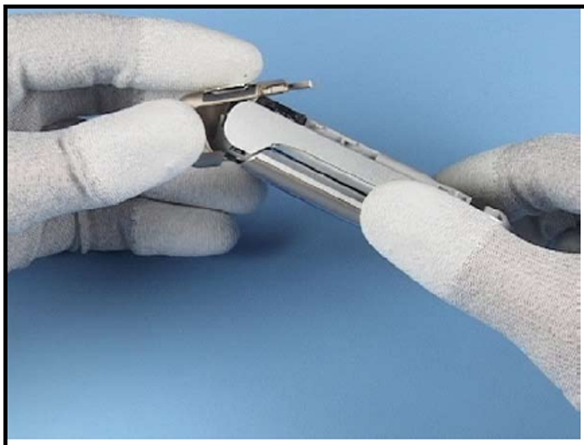
15. Insert the screws.



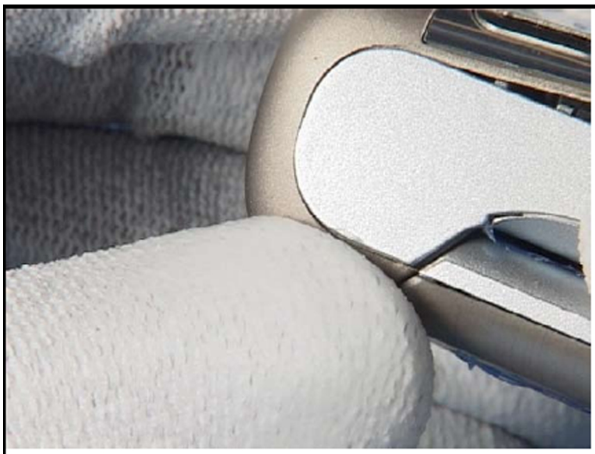
16. Set the correct torque.



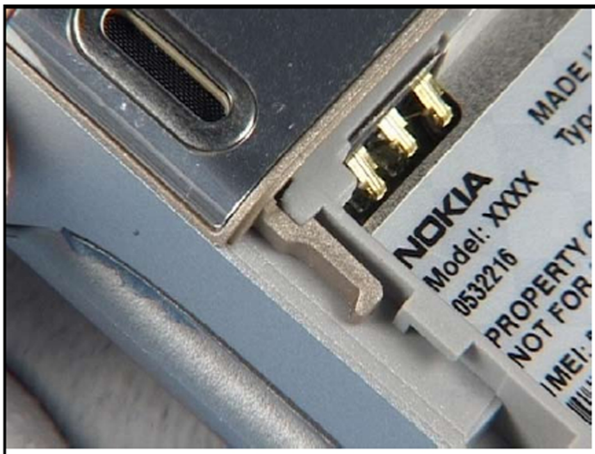
17. Apply the torque to all screws.



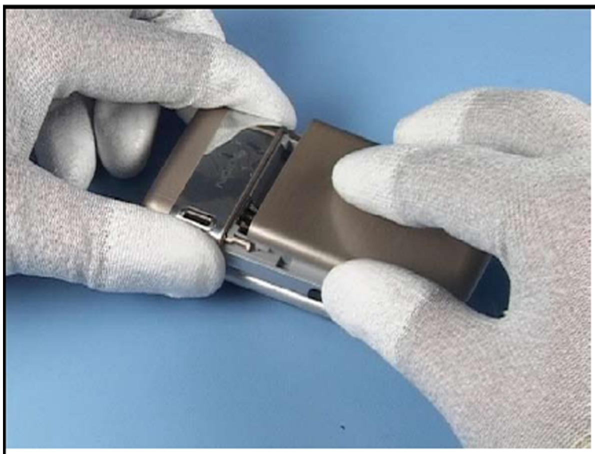
18. Fit the ANTENNA COVER.



19. Click the snaps into their places, beginning from the upper side of the ANTENNA COVER.


NOKIA
Model: XXXX
0532216
PROPERTY
NOT FOR
IMEI:
MADE
Typ

20. Note the correct positioning of the snaps gefore going on.



21. Complete the assembly with the BATTERY COVER.

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6 — BB Troubleshooting and Manual Tuning Guide

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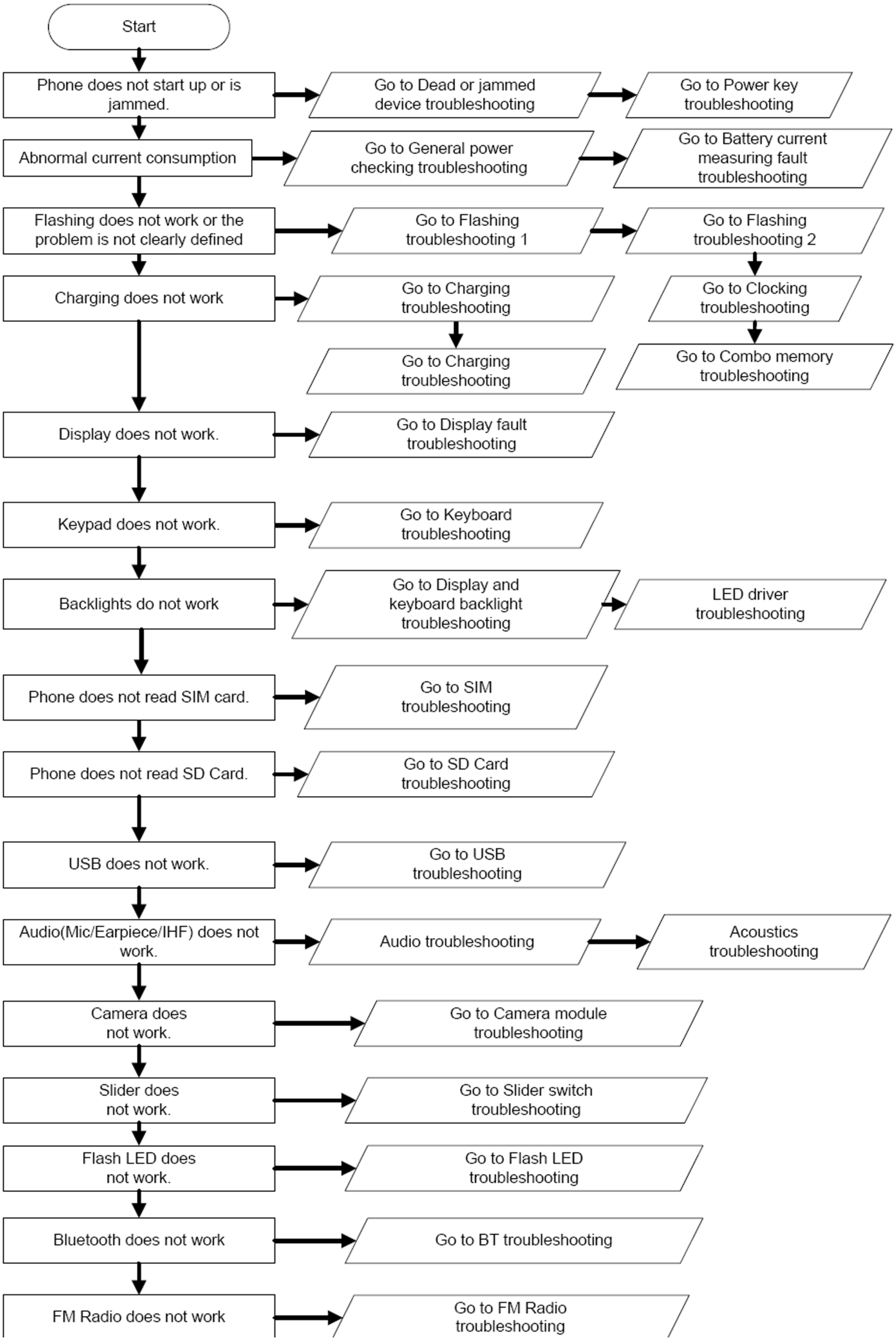
Baseband troubleshooting

Context

This section is intended to be a guide for localising and repairing electrical faults. The fault repairing is divided into troubleshooting paths.

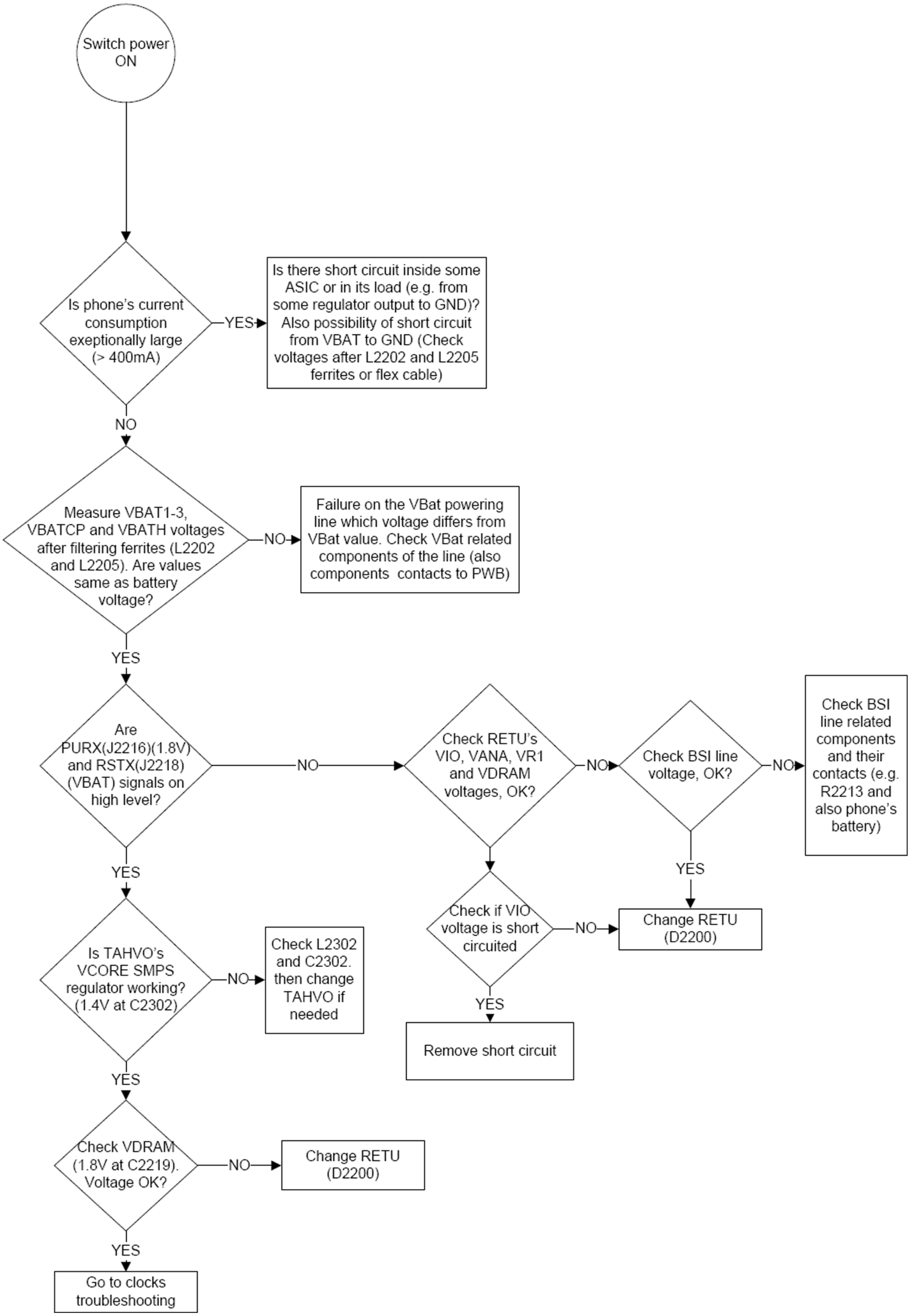
The following main troubleshooting tree describes the different baseband troubleshooting paths to be followed in fault situations.

Troubleshooting flow


Start
Phone does not start up or is jammed.
Go to Dead or jammed device troubleshooting
Go to Power key troubleshooting
Abnormal current consumption
Go to General power checking troubleshooting
Go to Battery current measuring fault troubleshooting
Flashing does not work or the problem is not clearly defined
Go to Flashing troubleshooting 1
Go to Flashing troubleshooting 2
Go to Clocking troubleshooting
Go to Combo memory troubleshooting
Charging does not work
Go to Charging troubleshooting
Go to Charging troubleshooting
Display does not work.
Go to Display fault troubleshooting
Keypad does not work.
Go to Keyboard troubleshooting
Backlights do not work
Go to Display and keyboard backlight troubleshooting
LED driver troubleshooting
Phone does not read SIM card.
Go to SIM troubleshooting
Phone does not read SD Card.
Go to SD Card troubleshooting
USB does not work.
Go to USB troubleshooting
Audio(Mic/Earpiece/IHF) does not work.
Audio troubleshooting
Acoustics troubleshooting
Camera does not work.
Go to Camera module troubleshooting
Slider does not work.
Go to Slider switch troubleshooting
Flash LED does not work.
Go to Flash LED troubleshooting
Bluetooth does not work
Go to BT troubleshooting
FM Radio does not work
Go to FM Radio troubleshooting

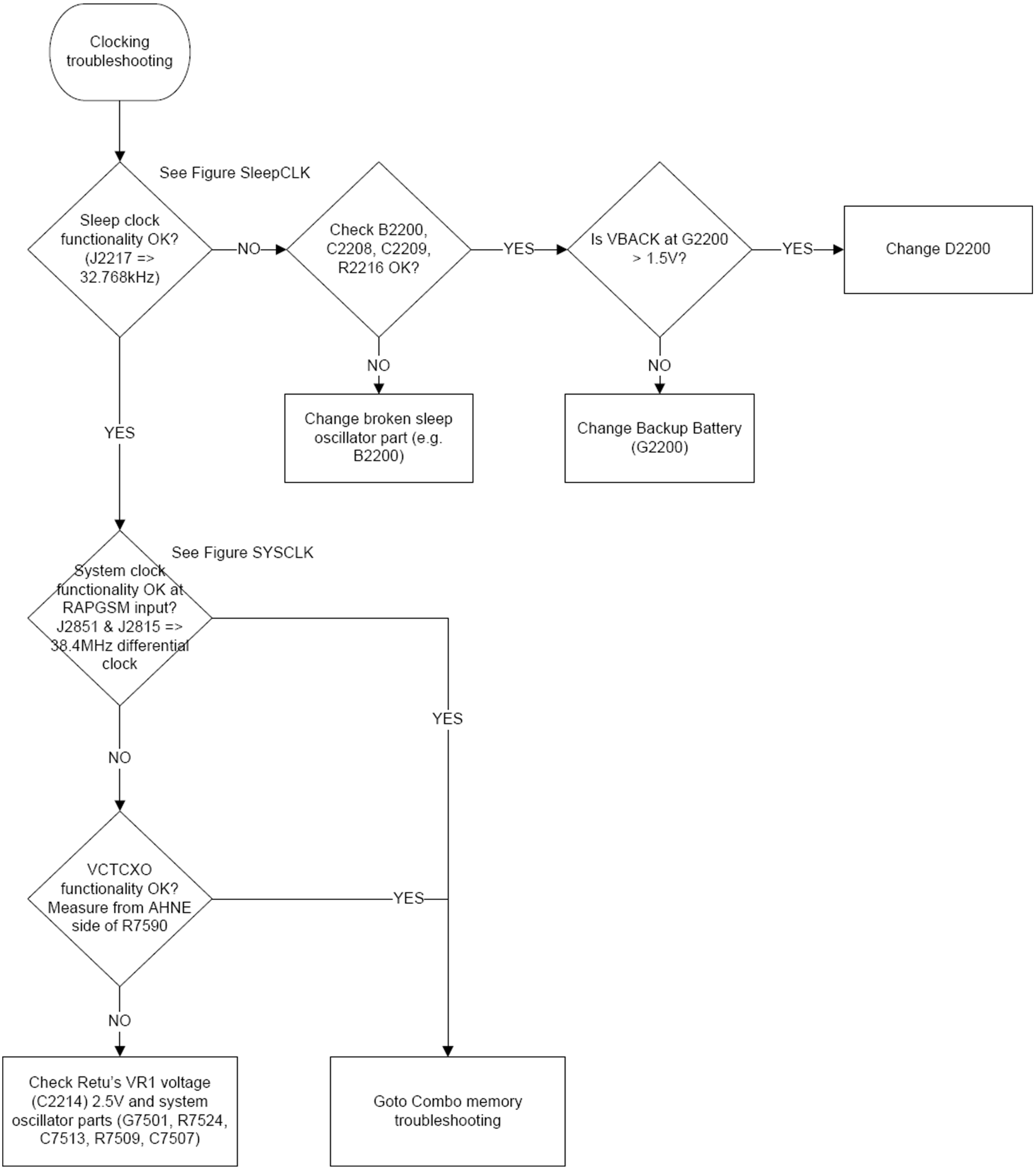
General power checking troubleshooting

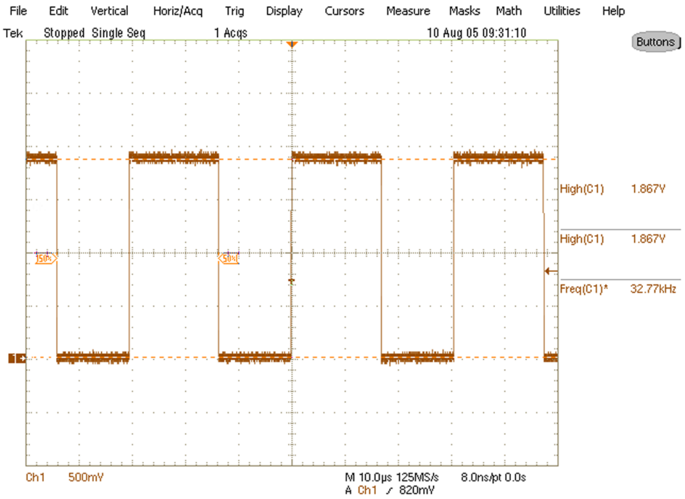
Troubleshooting flow


Switch power ON
Is phone's current consumption exeptionally large (> 400mA)
YES
Is there short circuit inside some ASIC or in its load (e.g. from some regulator output to GND)? Also possibility of short circuit from VBAT to GND (Check voltages after L2202 and L2205 ferrites or flex cable)
NO
Measure VBAT1-3, VBATCP and VBATH voltages after filtering ferrites (L2202 and L2205). Are values same as battery voltage?
NO
Failure on the VBat powering line which voltage differs from VBat value. Check VBat related components of the line (also components contacts to PWB)
YES
Are PURX(J2216)(1.8V) and RSTX(J2218) (VBAT) signals on high level?
NO
Check RETU's VIO, VANA, VR1 and VDRAM voltages, OK?
NO
Check BSI line voltage, OK?
NO
Check BSI line related components and their contacts (e.g. R2213 and also phone's battery)
YES
Change RETU (D2200)
Check if VIO voltage is short circuited
NO
YES
Remove short circuit
YES
Is TAHVO's VCORE SMPS regulator working? (1.4V at C2302)
NO
Check L2302 and C2302. then change TAHVO if needed
YES
Check VDRAM (1.8V at C2219). Voltage OK?
NO
Change RETU (D2200)
YES
Go to clocks troubleshooting

Clocking troubleshooting

Troubleshooting flow


Clocking troubleshooting
See Figure SleepCLK
Sleep clock functionality OK? (J2217 => 32.768kHz)
NO
Check B2200, C2208, C2209, R2216 OK?
YES
Is VBACK at G2200 > 1.5V?
YES
Change D2200
NO
Change broken sleep oscillator part (e.g. B2200)
NO
Change Backup Battery (G2200)
YES
See Figure SYSCLK
System clock functionality OK at RAPGSM input? J2851 & J2815 => 38.4MHz differential clock
YES
NO
VCTCXO functionality OK? Measure from AHNE side of R7590
YES
NO
Check Retu's VR1 voltage (C2214) 2.5V and system oscillator parts (G7501, R7524, C7513, R7509, C7507)
Goto Combo memory troubleshooting


File
Edit
Vertical
Horiz/Acq
Trig
Display
Cursors
Measure
Masks
Math
Utilities
Help
Buttons

Tek Stopped Single Seq 1 Acqs 10 Aug 05 09:31:10

High(C1) 1.867V

High(C1) 1.867V

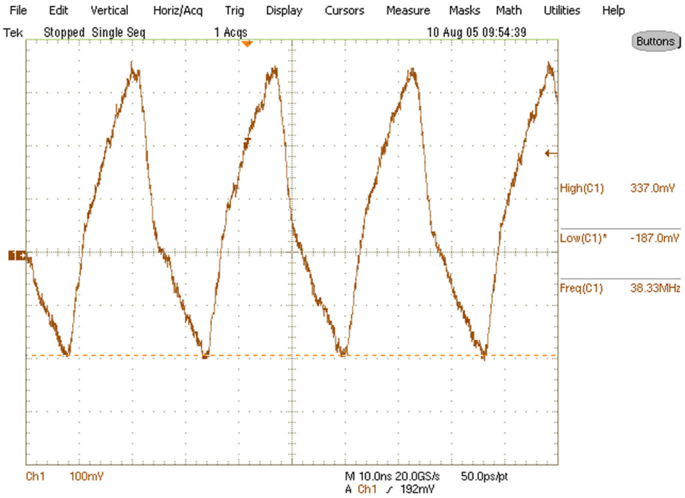
Freq(C1)* 32.77kHz

Ch1 500mV

M 10.0µs 125MS/s 8.0ns/pt 0.0s

A Ch1 ⁄ 820mV

Figure 34 SleepCLK


File
Edit
Vertical
Horiz/Acq
Trig
Display
Cursors
Measure
Masks
Math
Utilities
Help
Buttons

Tek Stopped Single Seq 1 Acqs 10 Aug 05 09:54:39

High(C1) 337.0mV

Low(C1)* -187.0mV

Freq(C1) 38.33MHz

Ch1 100mV

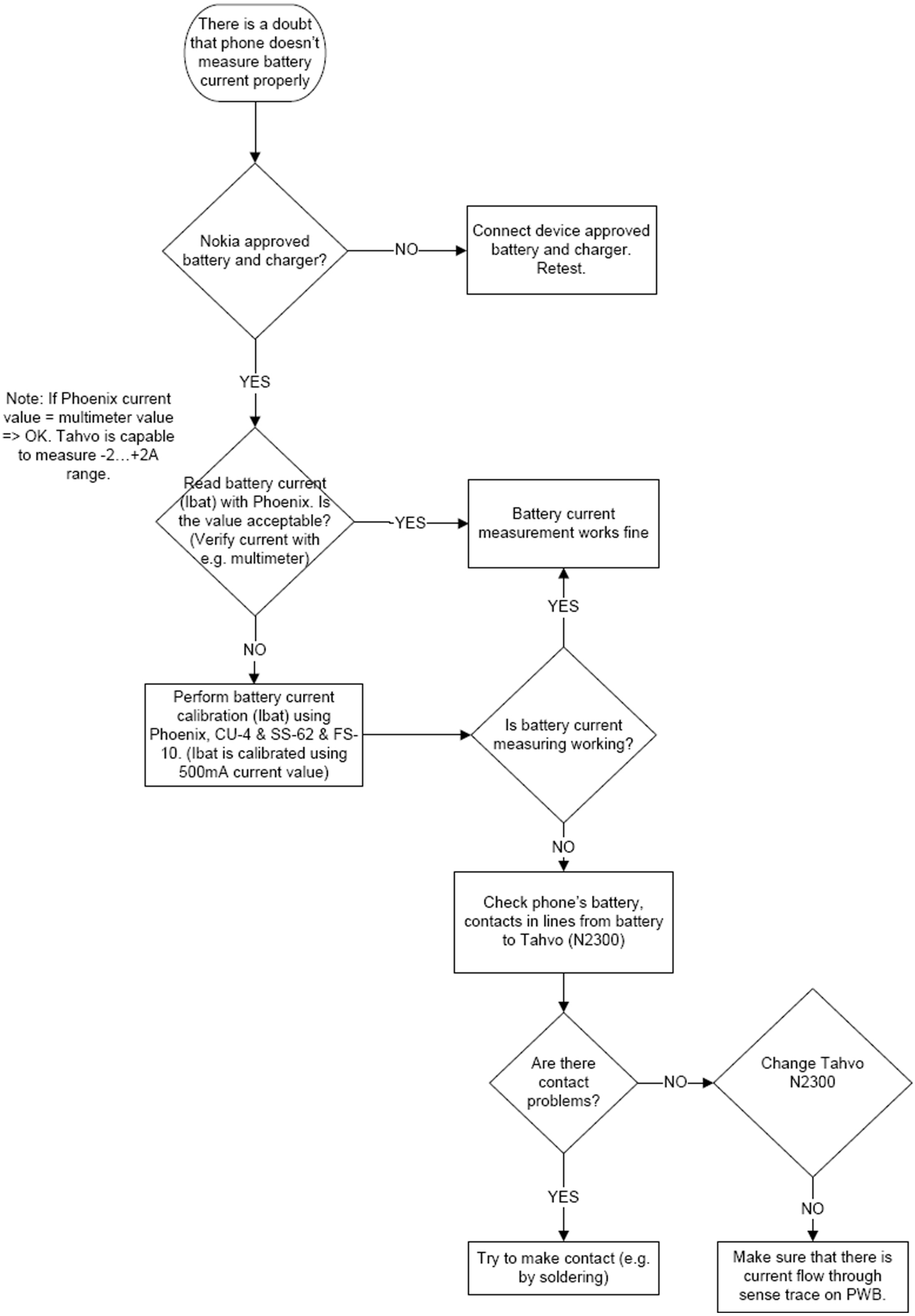
M 10.0ns 20.0GS/s 50.0ps/pt

A Ch1 ⁄ 192mV

Figure 35 SYSCLK

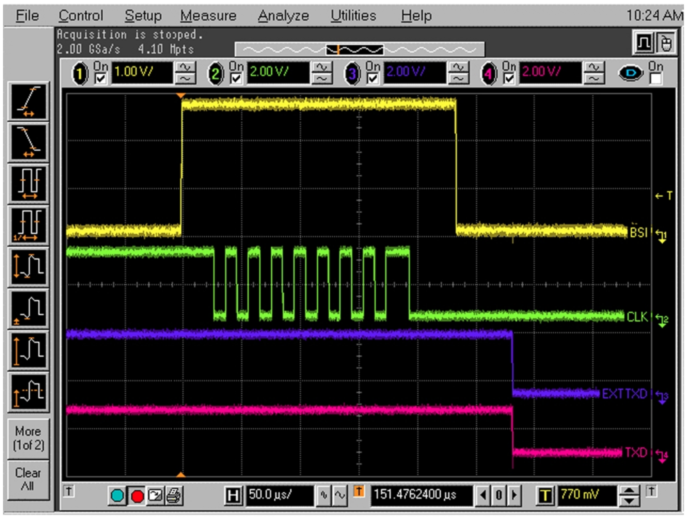
Battery current measuring fault troubleshooting

Troubleshooting flow


There is a doubt that phone doesn't measure battery current properly
Nokia approved battery and charger?
NO
Connect device approved battery and charger. Retest.
YES
Note: If Phoenix current value = multimeter value => OK. Tahvo is capable to measure -2…+2A range.
Read battery current (Ibat) with Phoenix. Is the value acceptable? (Verify current with e.g. multimeter)
YES
Battery current measurement works fine
NO
Perform battery current calibration (Ibat) using Phoenix, CU-4 & SS-62 & FS-10. (Ibat is calibrated using 500mA current value)
YES
Is battery current measuring working?
NO
Check phone's battery, contacts in lines from battery to Tahvo (N2300)
Are there contact problems?
NO
Change Tahvo N2300
YES
Try to make contact (e.g. by soldering)
NO
Make sure that there is current flow through sense trace on PWB.

Flash programming fault troubleshooting

Troubleshooting flow

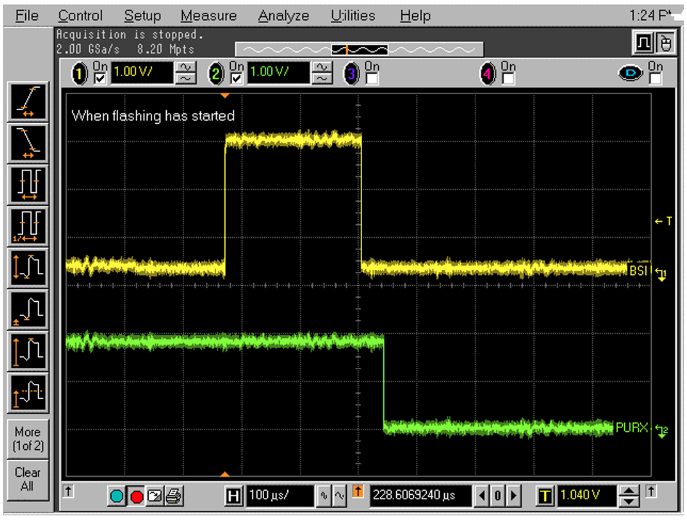


Acquisition is stopped.
2.00 GSa/s 4.10 Mpts

File Control Setup Measure Analyze Utilities Help
10:24 AM
1.00 V/
2.00 V/
2.00 V/
2.00 V/
BSI
CLK
EXTTXD
TXD
More (1of 2)
Clear All
50.0 µs/
151.4762400 µs
770 mV

Figure 36 Flashing pic 1. Take single trig measurement for the rise of the BSI signal.

Saved: 05 JUL 2004 13:24:19



Acquisition is stopped.
2.00 GSa/s 8.20 Mpts

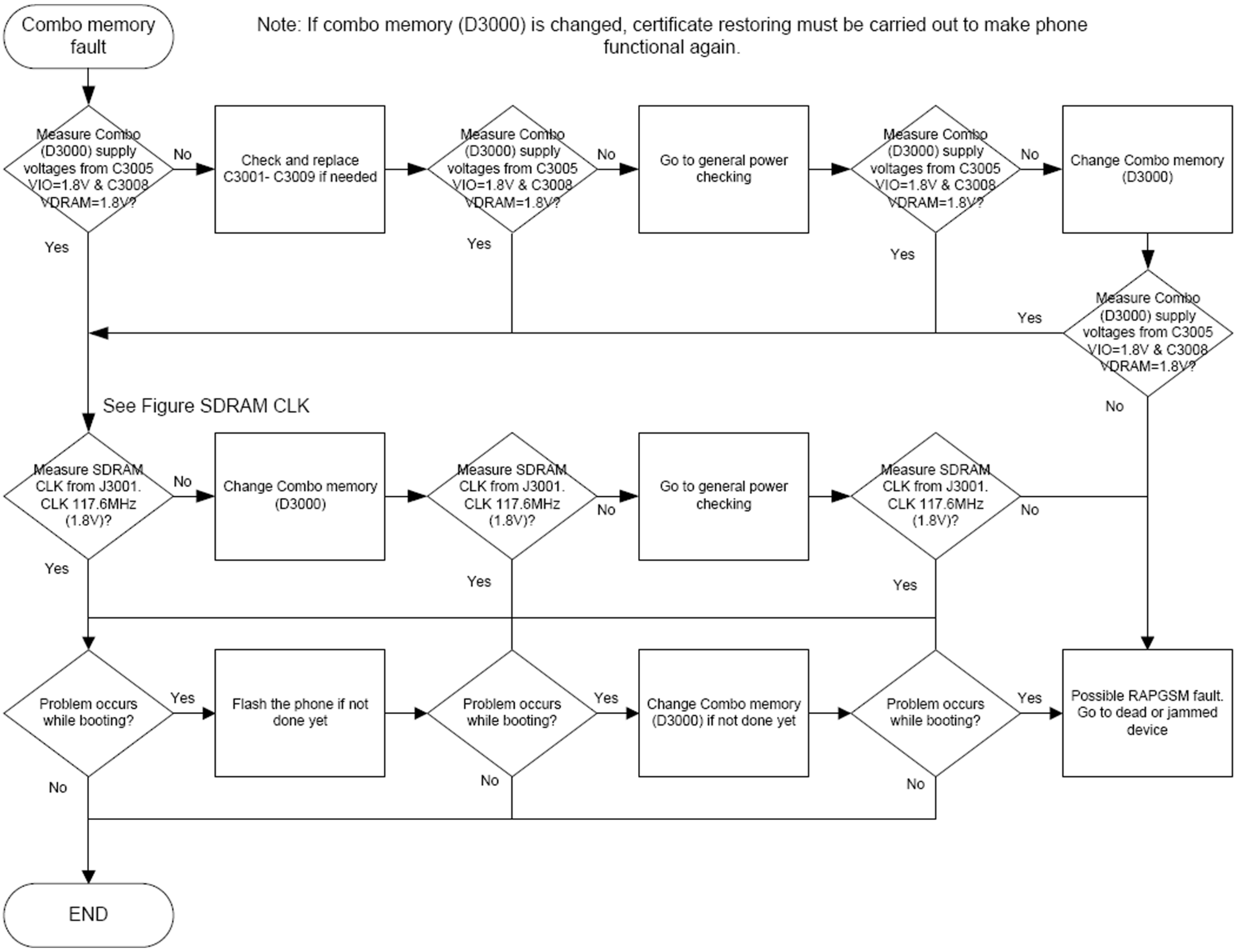
When flashing has started

File Control Setup Measure Analyze Utilities Help
1:24 P
1.00 V/
1.00 V/
BSI
PURX
More (1of 2)
Clear All
100 µs/
228.6069240 µs
1.040 V

Figure 37 Flashing pic 2. Take single trig measurement for the rise of the BSI signal.

COMBO memory troubleshooting

Troubleshooting flow


Combo memory fault
Note: If combo memory (D3000) is changed, certificate restoring must be carried out to make phone functional again.
Measure Combo (D3000) supply voltages from C3005 VIO=1.8V & C3008 VDRAM=1.8V?
No
Yes
Check and replace C3001- C3009 if needed
Go to general power checking
Change Combo memory (D3000)
See Figure SDRAM CLK
Measure SDRAM CLK from J3001. CLK 117.6MHz (1.8V)?
Change Combo memory (D3000)
Problem occurs while booting?
Flash the phone if not done yet
Change Combo memory (D3000) if not done yet
Possible RAPGSM fault. Go to dead or jammed device
END

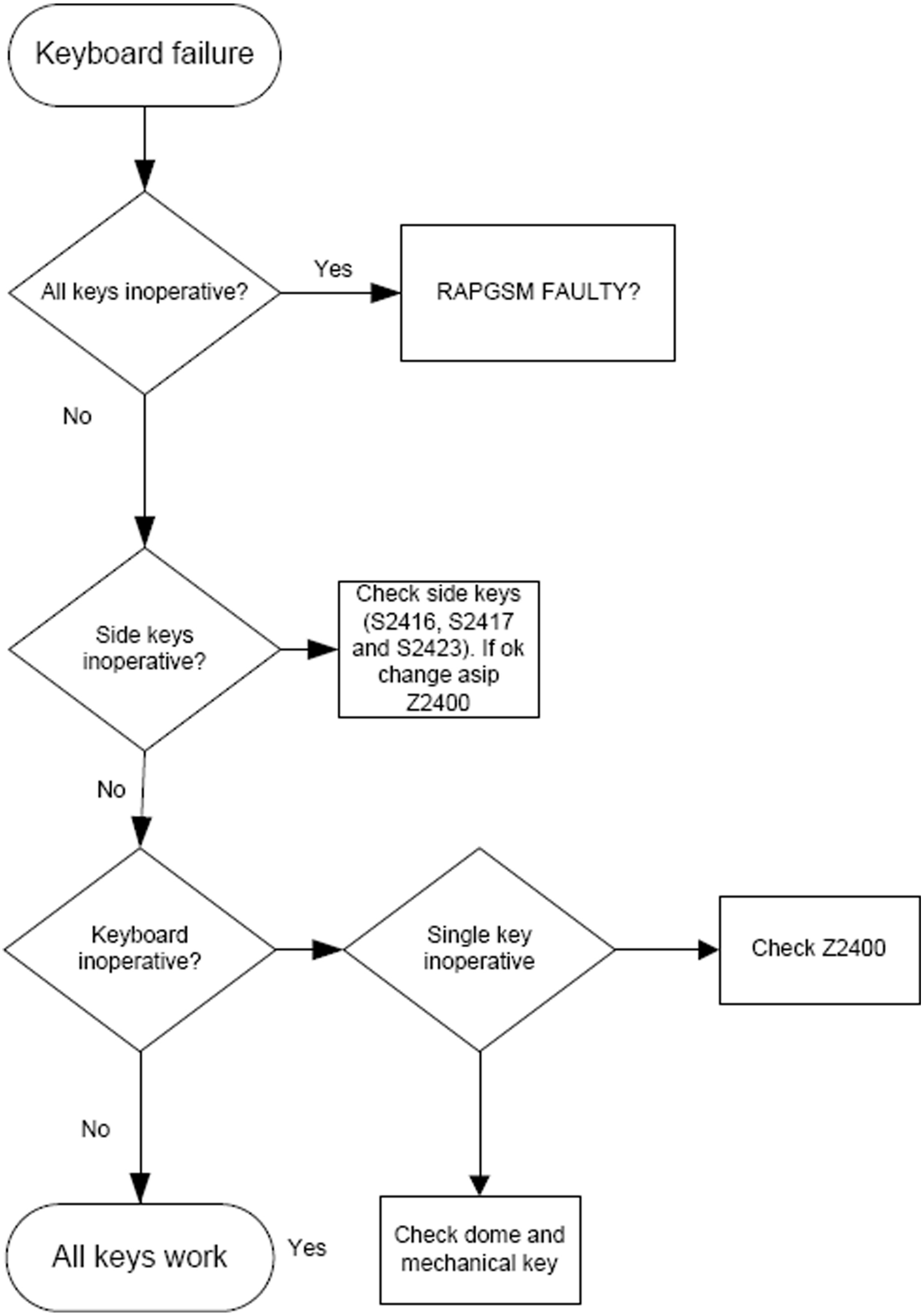
Keyboard troubleshooting

Context

There are two possible failure modes in the keyboard: a) One or more keys can be stuck, so that the key does not react when a keydome is pressed. This kind of failure is caused by mechanical reasons (dirt, rust), b) Malfunction of several keys at the same time; this happens when one or more rows or columns are failing (shortcut or open connection).

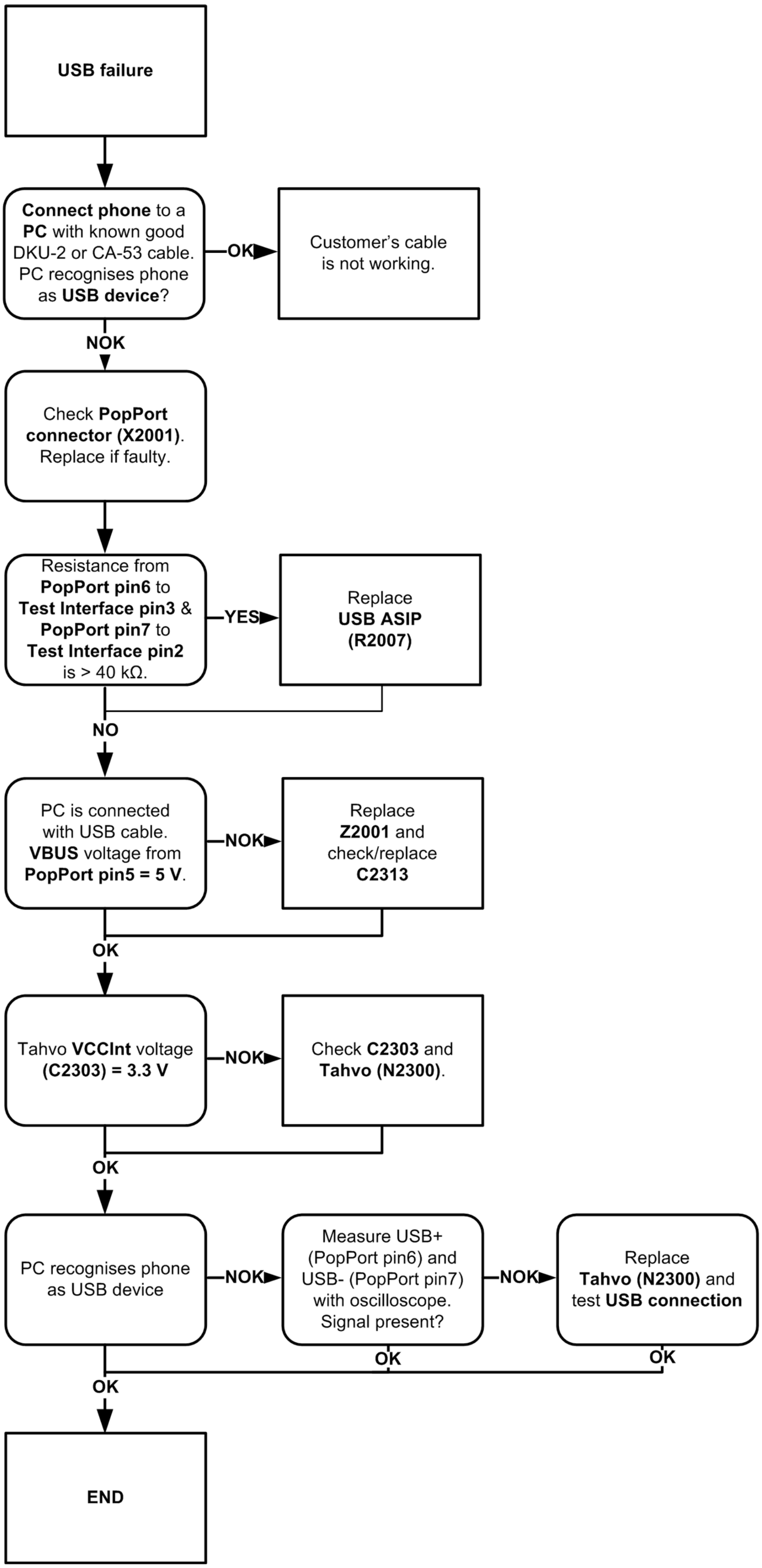
For a more detailed description of the keyboard and keymatrix, see section Keyboard. If the failure mode is not clear, start with the Keyboard Test in Phoenix.

Troubleshooting flow


Keyboard failure
All keys inoperative?
Yes
RAPGSM FAULTY?
No
Side keys inoperative?
Check side keys (S2416, S2417 and S2423). If ok change asip Z2400
No
Keyboard inoperative?
Single key inoperative
Check Z2400
No
All keys work
Yes
Check dome and mechanical key

USB troubleshooting

Troubleshooting flow


USB failure
Connect phone to a PC with known good DKU-2 or CA-53 cable. PC recognises phone as USB device?
OK
Customer's cable is not working.
NOK
Check PopPort connector (X2001). Replace if faulty.
Resistance from PopPort pin6 to Test Interface pin3 & PopPort pin7 to Test Interface pin2 is > 40 kΩ.
YES
Replace USB ASIP (R2007)
NO
PC is connected with USB cable. VBUS voltage from PopPort pin5 = 5 V.
NOK
Replace Z2001 and check/replace C2313
OK
Tahvo VCCInt voltage (C2303) = 3.3 V
NOK
Check C2303 and Tahvo (N2300).
OK
PC recognises phone as USB device
NOK
Measure USB+ (PopPort pin6) and USB- (PopPort pin7) with oscilloscope. Signal present?
NOK
Replace Tahvo (N2300) and test USB connection
OK
OK
OK
END

Backup battery troubleshooting

Verify that the backup battery is empty (U<1V). Switch the phone on. Measure voltage of the battery when the main battery is connected to the phone and the phone is switched on.

Wait a few minutes and monitor that the backup battery voltage rises. Switch off the phone, disconnect the main battery and monitor that the voltage of the backup battery fills up. Normal behaviour of the voltage is described in the figures below.

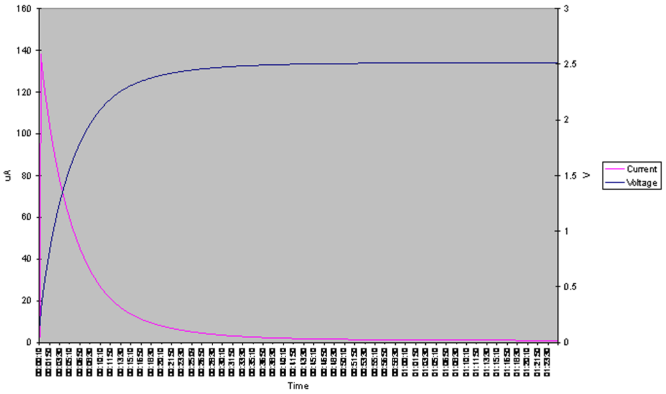


Figure 38 Charging backup battery

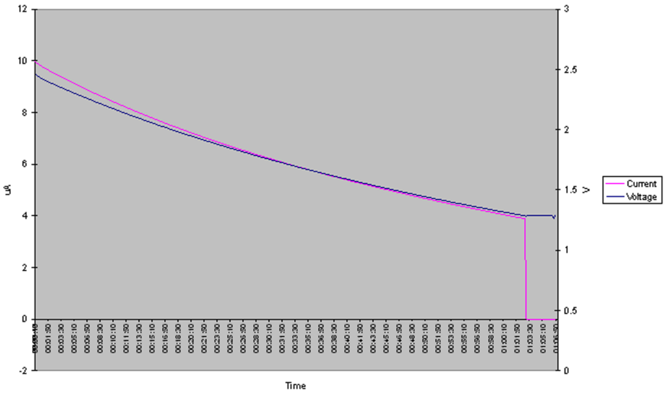
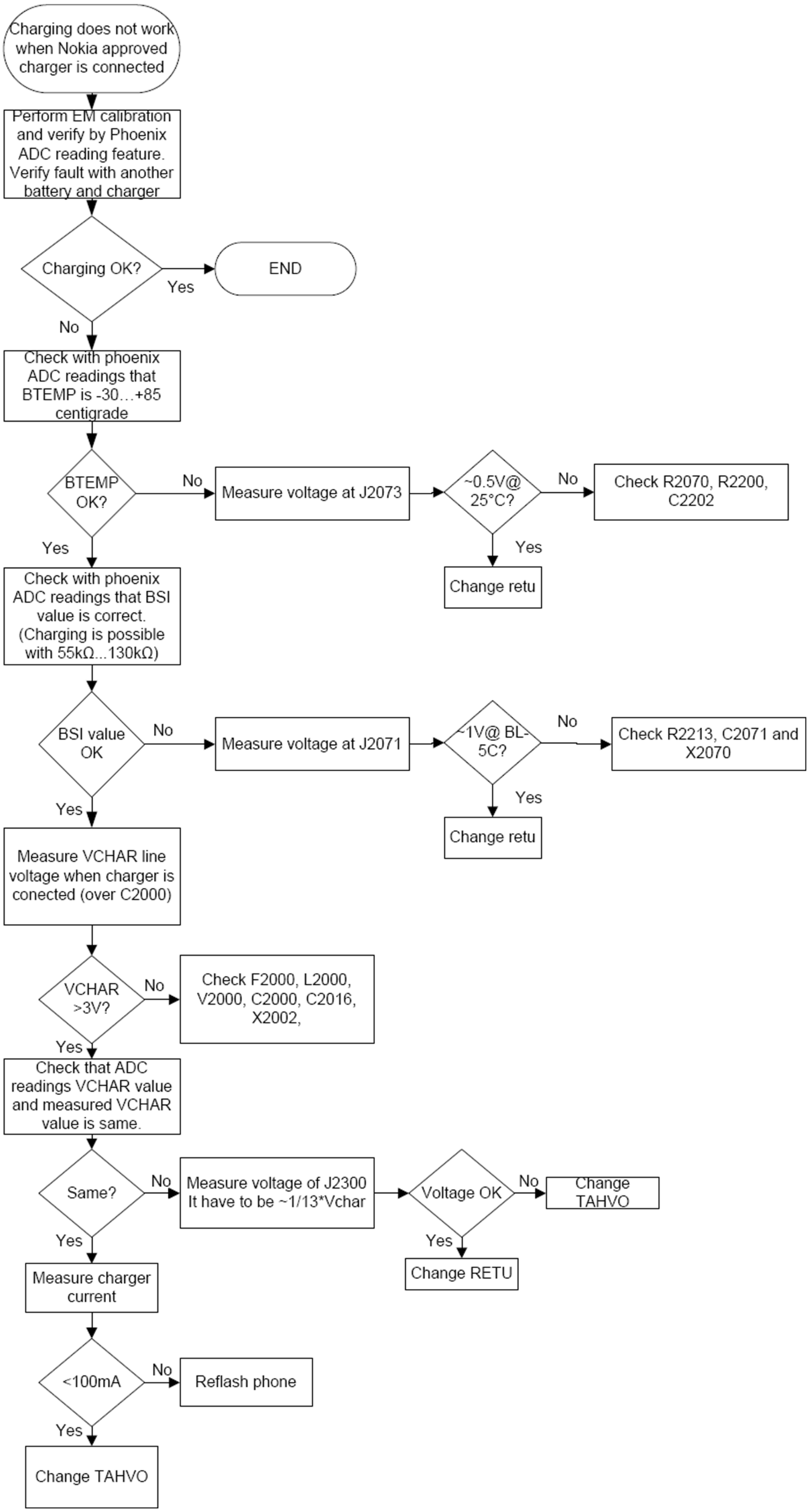


Figure 39 Discharging backup battery

If the voltage rises and falls quickly, check whether C2233 is broken or short-circuited. Backup battery can be also dead. If the voltage stays ~0V, check resistance VBACK against GND. If there is no short-circuit, RETU is faulty. Replace RETU.

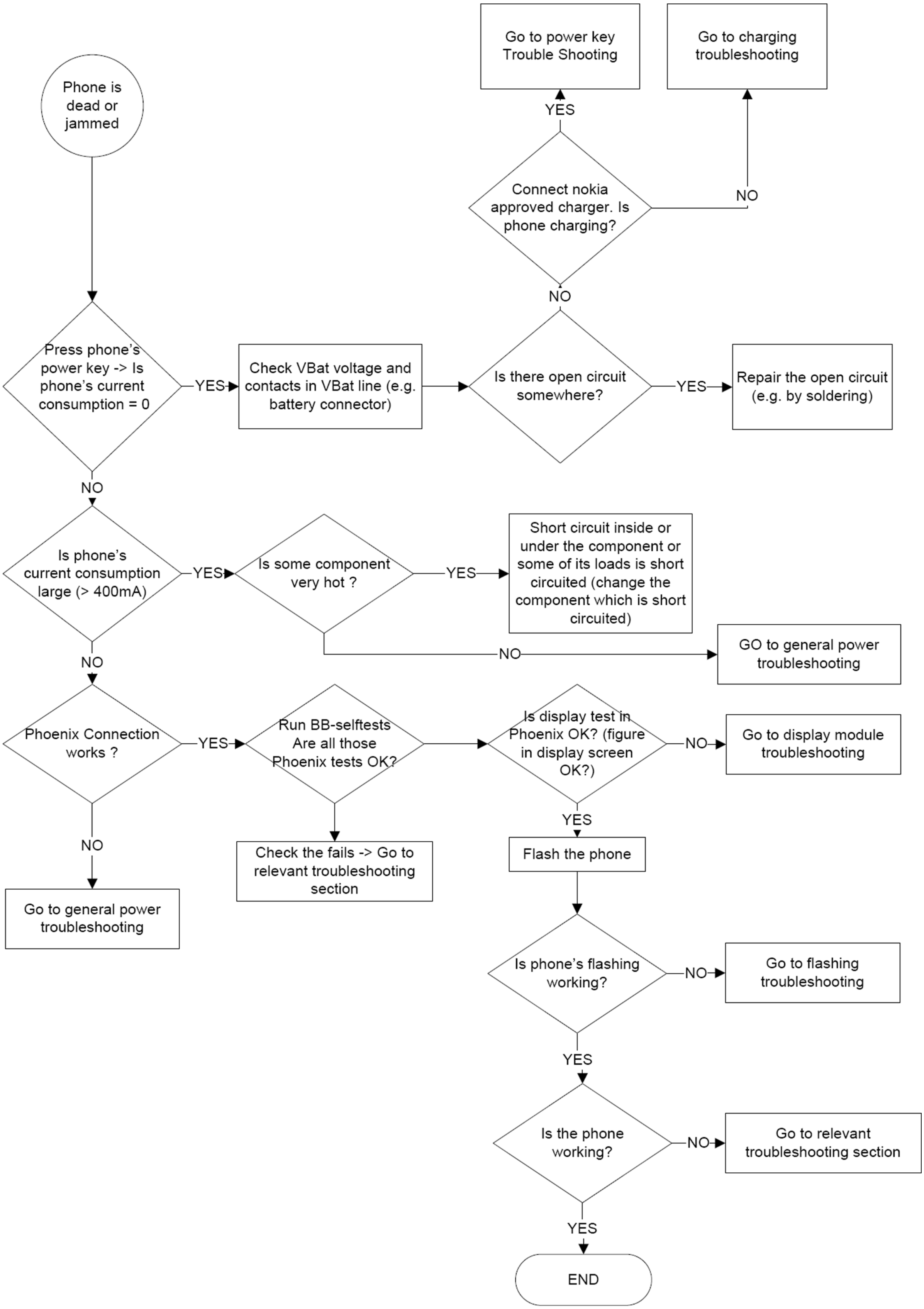
Charging troubleshooting

Troubleshooting flow


Charging does not work when Nokia approved charger is connected
Perform EM calibration and verify by Phoenix ADC reading feature. Verify fault with another battery and charger
Charging OK?
Yes
END
No
Check with phoenix ADC readings that BTEMP is -30…+85 centigrade
BTEMP OK?
No
Measure voltage at J2073
~0.5V@ 25°C?
No
Check R2070, R2200, C2202
Yes
Change retu
Yes
Check with phoenix ADC readings that BSI value is correct. (Charging is possible with 55kΩ...130kΩ)
BSI value OK
No
Measure voltage at J2071
~1V@ BL-5C?
No
Check R2213, C2071 and X2070
Yes
Change retu
Yes
Measure VCHAR line voltage when charger is conected (over C2000)
VCHAR >3V?
No
Check F2000, L2000, V2000, C2000, C2016, X2002,
Yes
Check that ADC readings VCHAR value and measured VCHAR value is same.
Same?
No
Measure voltage of J2300 It have to be ~1/13*Vchar
Voltage OK
No
Change TAHVO
Yes
Change RETU
Yes
Measure charger current
<100mA
No
Reflash phone
Yes
Change TAHVO

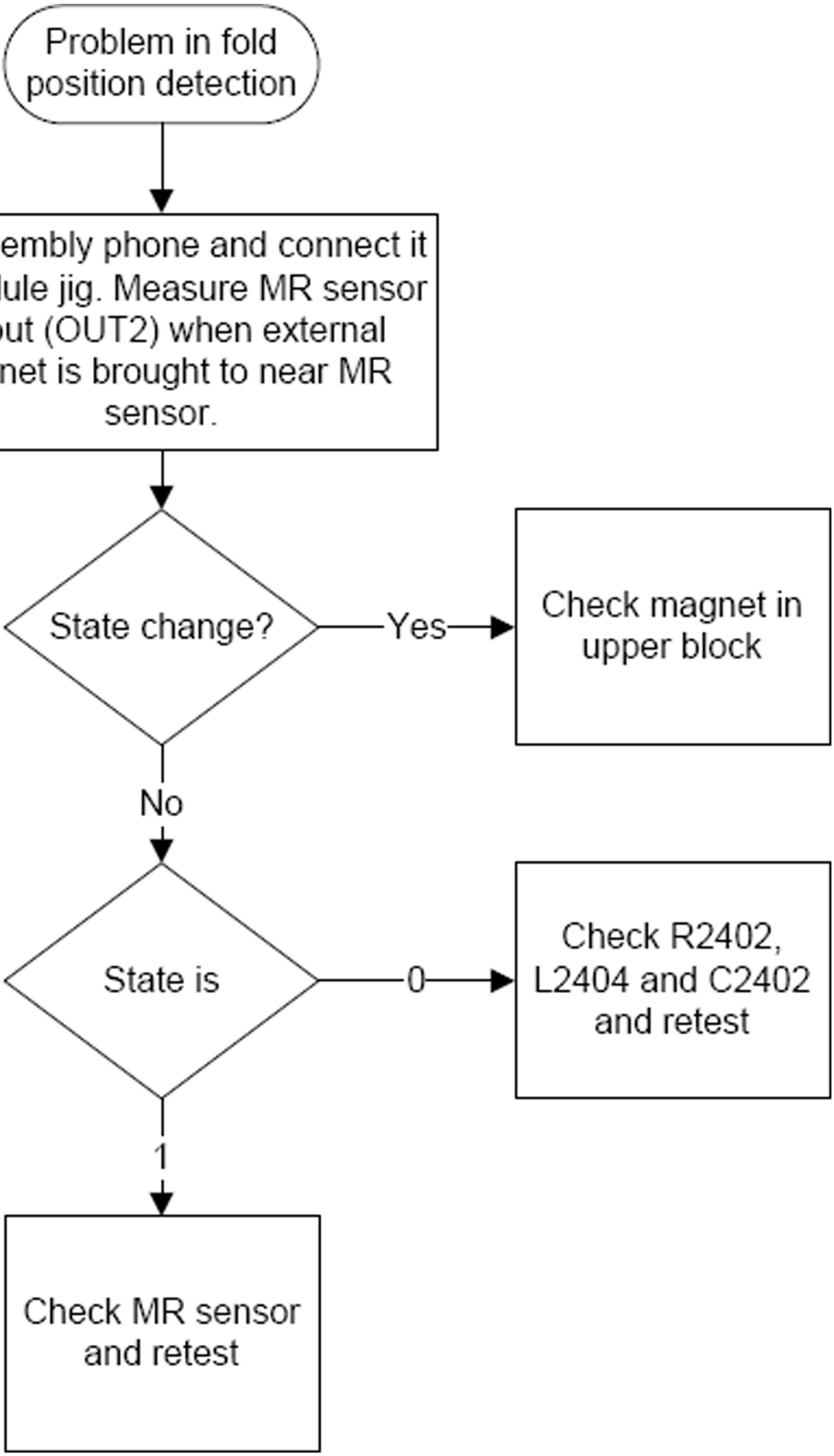
Dead or jammed troubleshooting

Troubleshooting flow


Phone is dead or jammed
Press phone's power key -> Is phone's current consumption = 0
YES
Check VBat voltage and contacts in VBat line (e.g. battery connector)
Is there open circuit somewhere?
YES
Repair the open circuit (e.g. by soldering)
NO
Connect nokia approved charger. Is phone charging?
YES
Go to power key Trouble Shooting
NO
Go to charging troubleshooting
NO
Is phone's current consumption large (> 400mA)
YES
Is some component very hot ?
YES
Short circuit inside or under the component or some of its loads is short circuited (change the component which is short circuited)
NO
GO to general power troubleshooting
NO
Phoenix Connection works ?
YES
Run BB-selftests Are all those Phoenix tests OK?
Check the fails -> Go to relevant troubleshooting section
Is display test in Phoenix OK? (figure in display screen OK?)
NO
Go to display module troubleshooting
YES
Flash the phone
Is phone's flashing working?
NO
Go to flashing troubleshooting
YES
Is the phone working?
NO
Go to relevant troubleshooting section
YES
END
NO
Go to general power troubleshooting

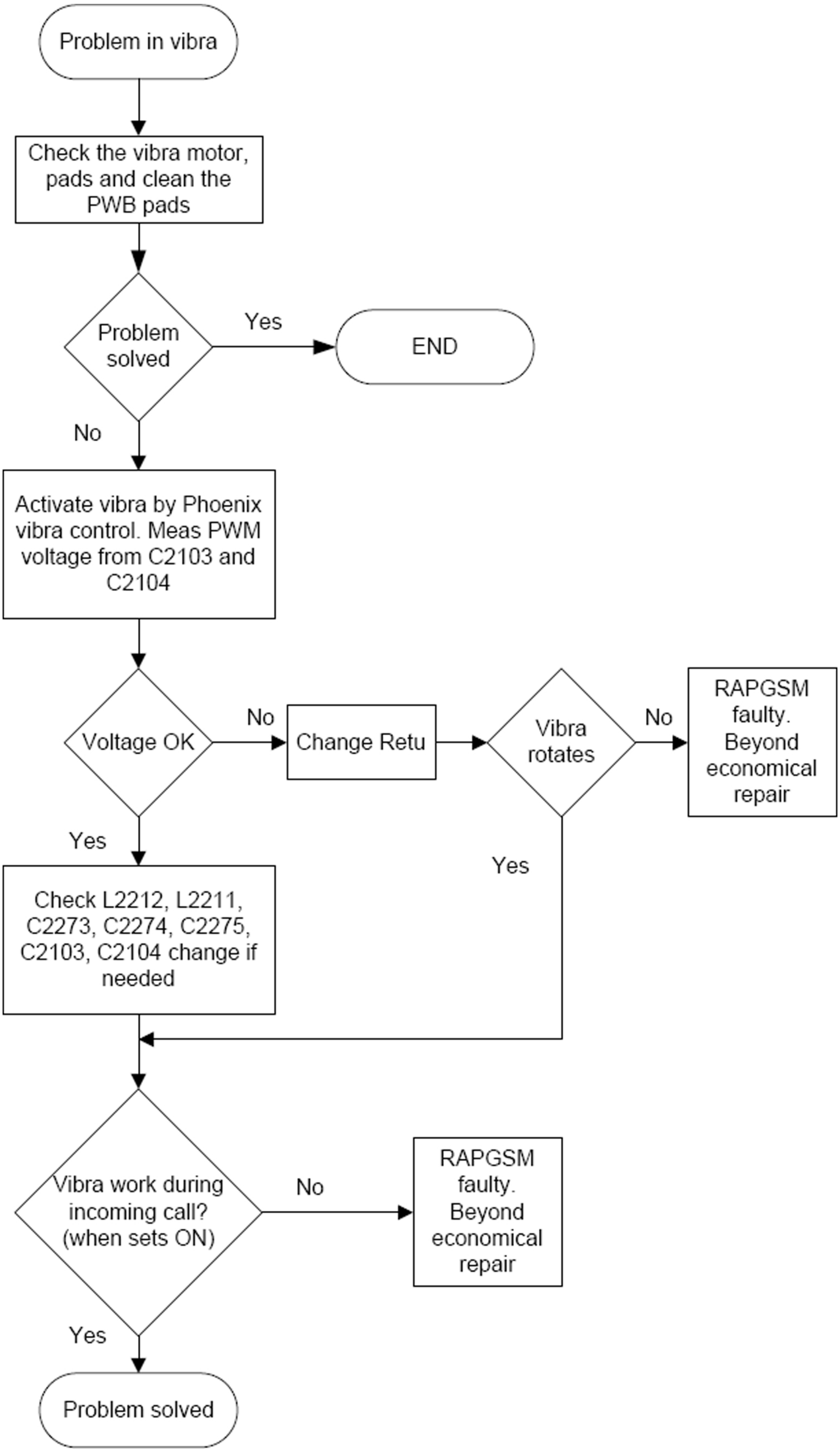
MR sensor troubleshooting

Troubleshooting flow


Problem in fold position detection
Disassembly phone and connect it to module jig. Measure MR sensor output (OUT2) when external magnet is brought to near MR sensor.
State change?
Yes
Check magnet in upper block
No
State is
0
Check R2402, L2404 and C2402 and retest
1
Check MR sensor and retest

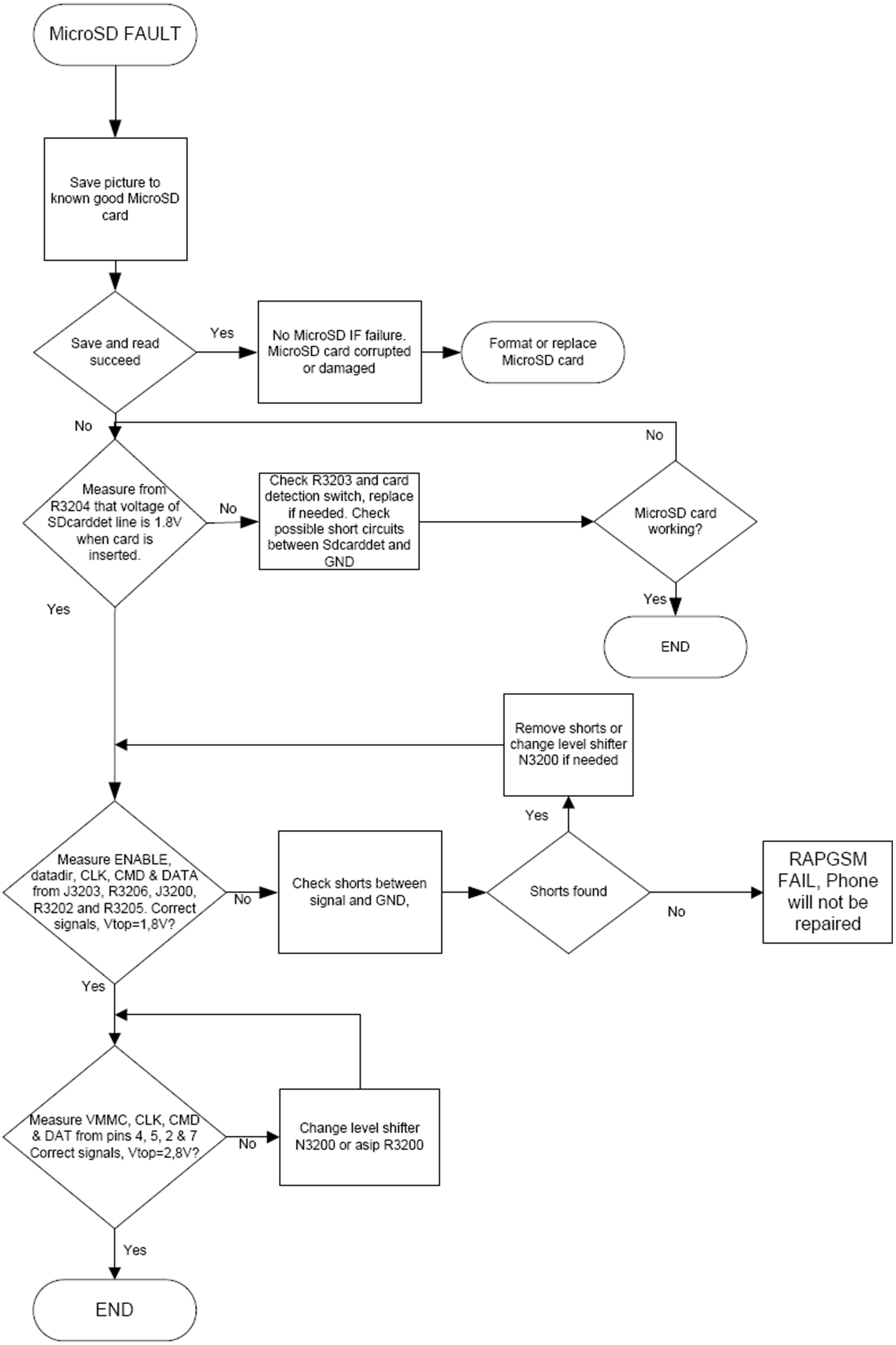
Vibra troubleshooting

Troubleshooting flow


Problem in vibra
Check the vibra motor, pads and clean the PWB pads
Problem solved
Yes
END
No
Activate vibra by Phoenix vibra control. Meas PWM voltage from C2103 and C2104
Voltage OK
No
Change Retu
Vibra rotates
No
RAPGSM faulty. Beyond economical repair
Yes
Yes
Check L2212, L2211, C2273, C2274, C2275, C2103, C2104 change if needed
Vibra work during incoming call? (when sets ON)
No
RAPGSM faulty. Beyond economical repair
Yes
Problem solved

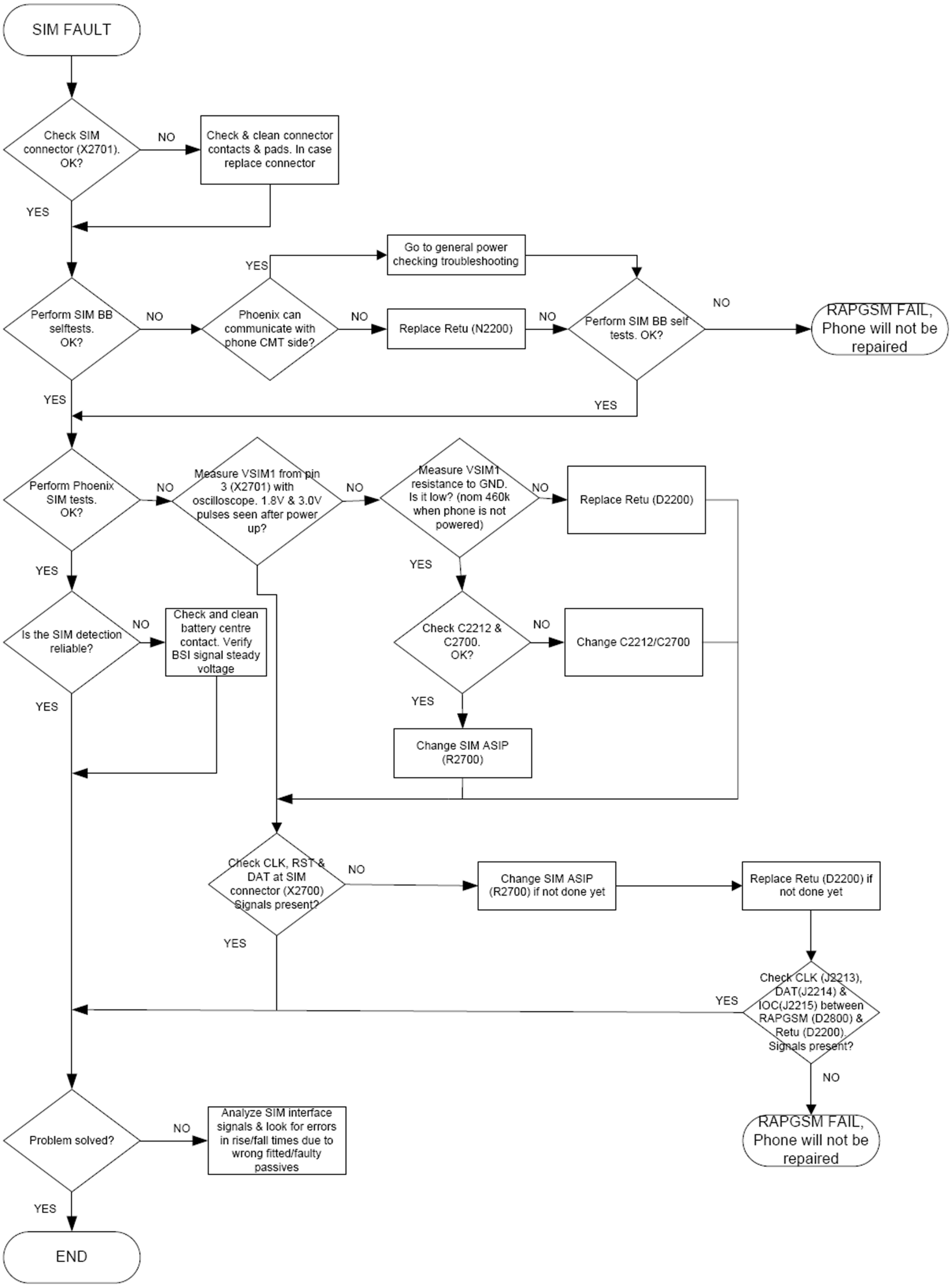
MicroSD troubleshooting

Troubleshooting flow


MicroSD FAULT
Save picture to known good MicroSD card
Save and read succeed
Yes
No MicroSD IF failure. MicroSD card corrupted or damaged
Format or replace MicroSD card
No
No
Measure from R3204 that voltage of SDcarddet line is 1.8V when card is inserted.
No
Check R3203 and card detection switch, replace if needed. Check possible short circuits between Sdcarddet and GND
MicroSD card working?
Yes
END
Yes
Remove shorts or change level shifter N3200 if needed
Yes
Measure ENABLE, datadir, CLK, CMD & DATA from J3203, R3206, J3200, R3202 and R3205. Correct signals, Vtop=1,8V?
No
Check shorts between signal and GND,
Shorts found
No
RAPGSM FAIL, Phone will not be repaired
Yes
Measure VMMC, CLK, CMD & DAT from pins 4, 5, 2 & 7 Correct signals, Vtop=2,8V?
No
Change level shifter N3200 or asip R3200
Yes
END

SIM troubleshooting

Troubleshooting flow


SIM FAULT
Check SIM connector (X2701). OK?
NO
Check & clean connector contacts & pads. In case replace connector
YES
Perform SIM BB selftests. OK?
NO
Phoenix can communicate with phone CMT side?
YES
Go to general power checking troubleshooting
NO
Replace Retu (N2200)
NO
Perform SIM BB self tests. OK?
NO
RAPGSM FAIL, Phone will not be repaired
YES
YES
Perform Phoenix SIM tests. OK?
NO
Measure VSIM1 from pin 3 (X2701) with oscilloscope. 1.8V & 3.0V pulses seen after power up?
NO
Measure VSIM1 resistance to GND. Is it low? (nom 460k when phone is not powered)
NO
Replace Retu (D2200)
YES
Check C2212 & C2700. OK?
NO
Change C2212/C2700
YES
Change SIM ASIP (R2700)
YES
Is the SIM detection reliable?
NO
Check and clean battery centre contact. Verify BSI signal steady voltage
YES
Check CLK, RST & DAT at SIM connector (X2700) Signals present?
NO
Change SIM ASIP (R2700) if not done yet
Replace Retu (D2200) if not done yet
YES
Check CLK (J2213), DAT(J2214) & IOC(J2215) between RAPGSM (D2800) & Retu (D2200). Signals present?
YES
NO
RAPGSM FAIL, Phone will not be repaired
Problem solved?
NO
Analyze SIM interface signals & look for errors in rise/fall times due to wrong fitted/faulty passives
YES
END

Display module troubleshooting

General instructions for display troubleshooting

The first step is to verify with a working display that the fault is not on the display module itself. The display module cannot be repaired.

The second step is to check that the cellular engine is working normally. This can be done by connecting the phone to a docking station and starting Phoenix service software. With the help of Phoenix read the phone information to check that also the application engine is functioning normally (you should be able to read the APE ID).

After these checks proceed to the display troubleshooting flowcharts. Use the Display Test tool in Phoenix to find the detailed fault mode.

Operating modes of the display

The display is in a normal mode when the phone is in active use.

The display is in a partial idle mode when the phone is in the screen saver mode.

The operating modes of the display can be controlled with the help of Phoenix.

Table 8 Display module troubleshooting cases

Display blank	There is no image on the display. The display looks the same when the phone is on as it does when the phone is off. Because the main display is transmissive type only, the backlight of the main display must be ON when checking the display's functionality.
Image on the display not correct	Image on the display can be corrupted or a part of the image can be missing. If a part of the image is missing, change the display module. If the image is otherwise corrupted, follow the appropriate troubleshooting diagram.
Backlight dim or not working at all	Backlight LED components are inside the display module. Backlight failure can also be in the connector or in the backlight power source in the main engine of the phone. Backlight is also controlled automatically by the ambient light sensor. This means that in case the display is working (image OK), but the backlight is not, follow the Display and Keyboard Backlight troubleshooting.
Visual defects (pixel)	Pixel defects can be checked by controlling the display with Phoenix. Use both colours, black and white, on a full screen. The display may have some random pixel defects that are acceptable for this type of display. The criteria when pixel defects are regarded as a display failure, resulting in a replacement of the display, are presented the following table.

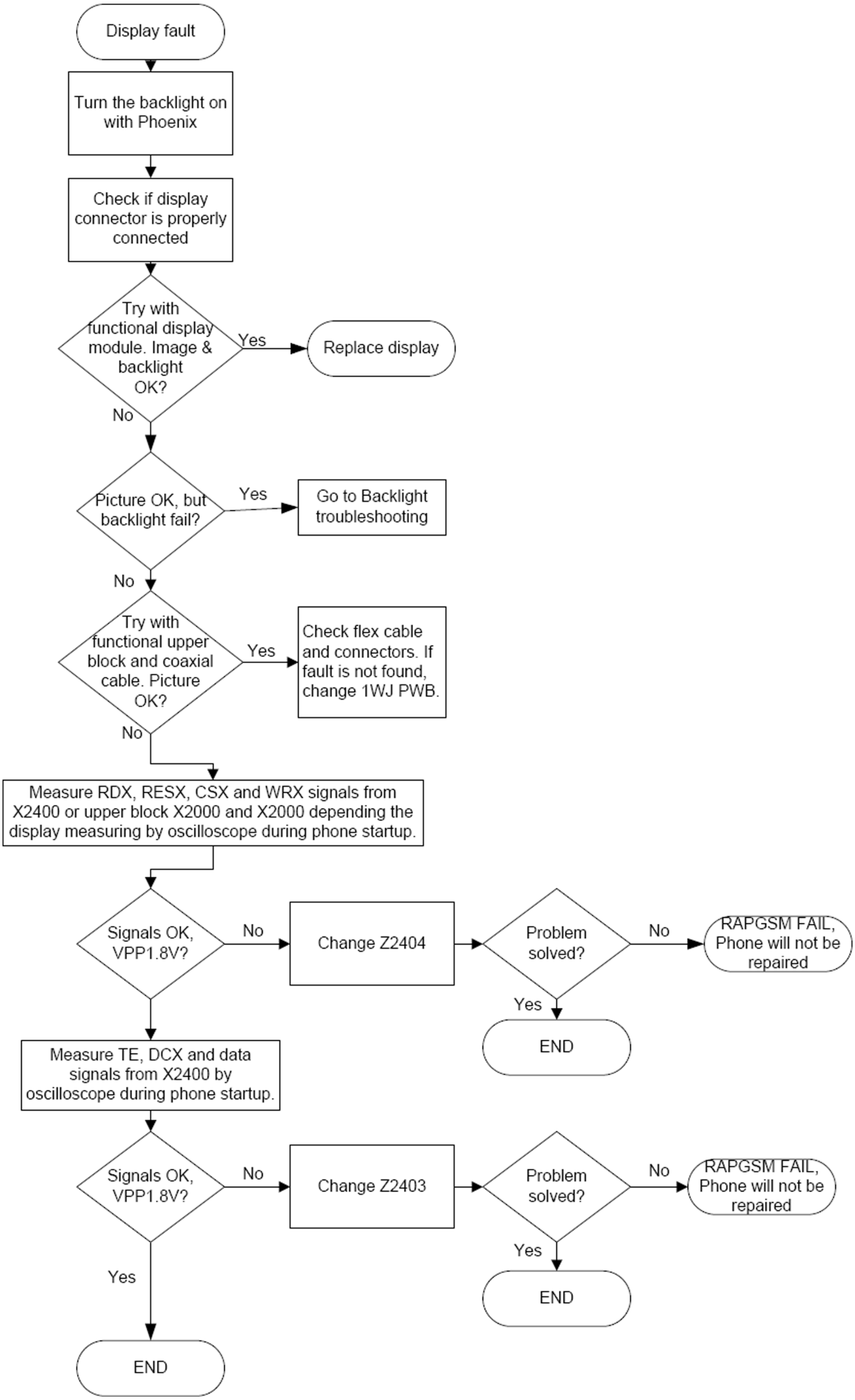
Table 9 Pixel defects

Item		White dot defect				Black dot defect	Total
1	Defect counts	R	G	B	White Dot Total	1	1
		1	1	1	1		
2	Combined defect counts	Not allowed. Two single dot defects that are within 5 mm of each other should be interpreted as combined dot defect.					

Note: Blinking pixels are not allowed in normal operating temperatures and light conditions. 2nd display is two-colored, black and white with blue LEDs.

Display fault troubleshooting (main and second displays)

Troubleshooting flow

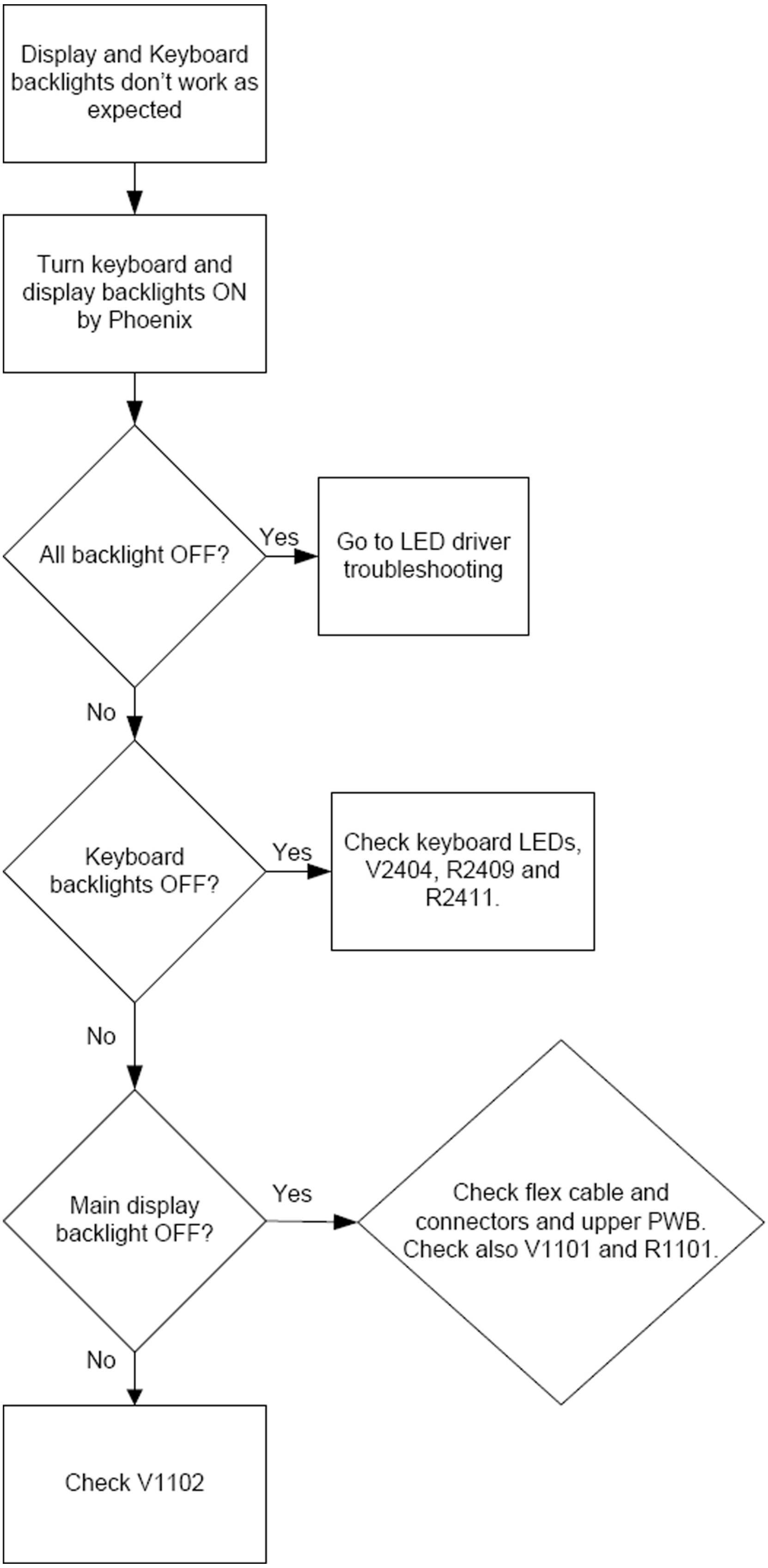

Display fault
Turn the backlight on with Phoenix
Check if display connector is properly connected
Try with functional display module. Image & backlight OK?
Yes
Replace display
No
Picture OK, but backlight fail?
Yes
Go to Backlight troubleshooting
No
Try with functional upper block and coaxial cable. Picture OK?
Yes
Check flex cable and connectors. If fault is not found, change 1WJ PWB.
No
Measure RDX, RESX, CSX and WRX signals from X2400 or upper block X2000 and X2000 depending the display measuring by oscilloscope during phone startup.
Signals OK, VPP1.8V?
No
Change Z2404
Problem solved?
No
RAPGSM FAIL, Phone will not be repaired
Yes
END
Measure TE, DCX and data signals from X2400 by oscilloscope during phone startup.
Signals OK, VPP1.8V?
No
Change Z2403
Problem solved?
No
RAPGSM FAIL, Phone will not be repaired
Yes
END
Yes
END

Displays and keyboard backlight troubleshooting

Context

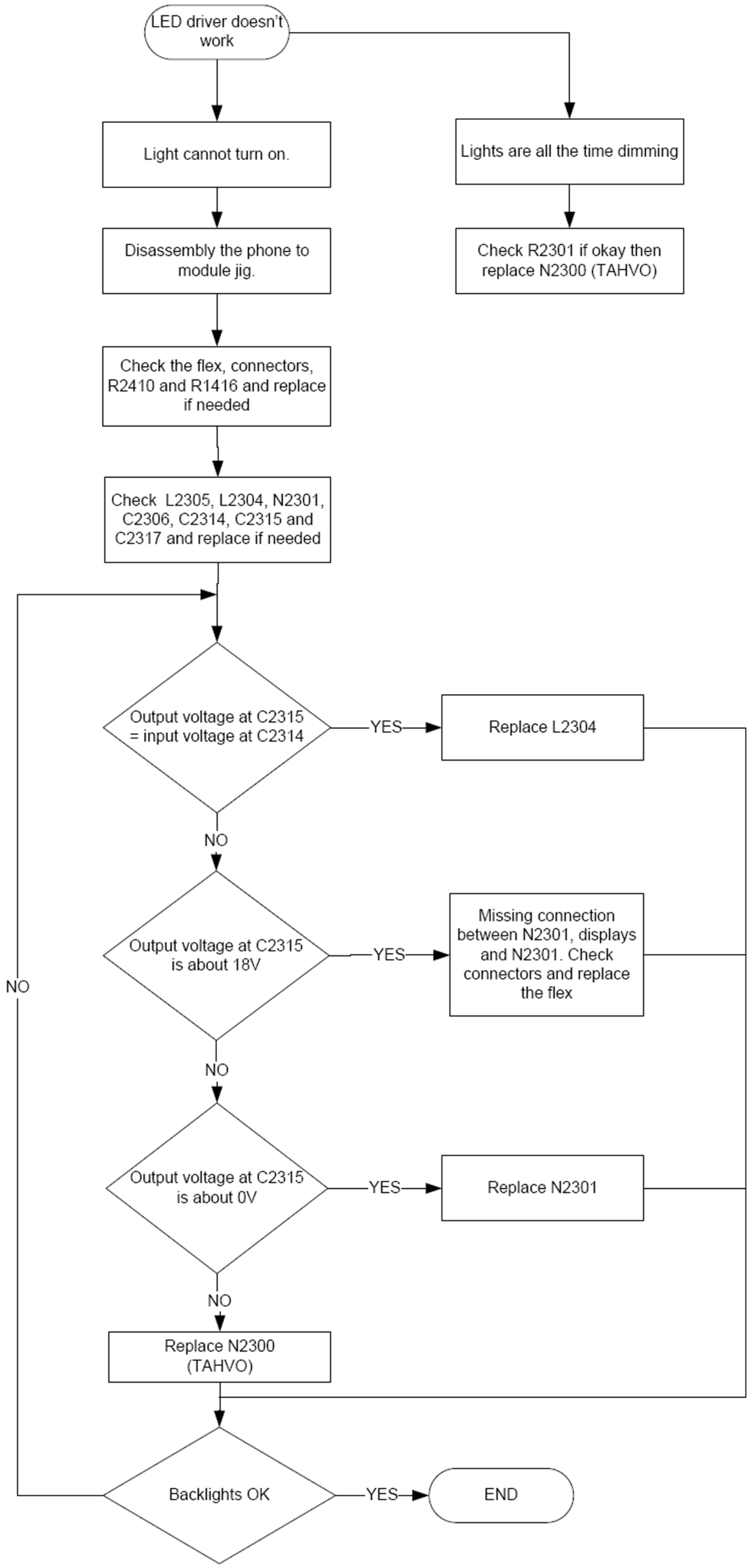
The device has one LED driver that provides current for both displays and keyboard backlights. The driver gets the PWM signal from Tahvo. Because of the main display is transmissive, HW light dimming (controlled by TAHVO GENOUT01) is also implemented. There is also a switch for selecting which display is lit on. It is not possible to turn on both displays' lights at the same time. The backlight brightness can be adjusted manually in Phoenix.

Troubleshooting flow


Display and Keyboard backlights don't work as expected
Turn keyboard and display backlights ON by Phoenix
All backlight OFF?
Yes
Go to LED driver troubleshooting
No
Keyboard backlights OFF?
Yes
Check keyboard LEDs, V2404, R2409 and R2411.
No
Main display backlight OFF?
Yes
Check flex cable and connectors and upper PWB. Check also V1101 and R1101.
No
Check V1102

LED driver troubleshooting

Troubleshooting flow


LED driver doesn't work
Light cannot turn on.
Lights are all the time dimming
Disassembly the phone to module jig.
Check R2301 if okay then replace N2300 (TAHVO)
Check the flex, connectors, R2410 and R1416 and replace if needed
Check L2305, L2304, N2301, C2306, C2314, C2315 and C2317 and replace if needed
Output voltage at C2315 = input voltage at C2314
YES
Replace L2304
NO
Output voltage at C2315 is about 18V
YES
Missing connection between N2301, displays and N2301. Check connectors and replace the flex
NO
Output voltage at C2315 is about 0V
YES
Replace N2301
NO
Replace N2300 (TAHVO)
NO
Backlights OK
YES
END

Camera troubleshooting

Introduction to camera troubleshooting

Bad conditions often cause bad pictures. Therefore, the camera operation has to be checked in constant conditions or by using a second, known-to-be-good Nokia device as reference. Image quality is hard to measure quantitatively, and the difference between a good and a bad picture can be small. Some training or experience may be needed to detect what is actually wrong.

When checking for possible errors in camera functionality, knowing what error is suspected significantly helps the testing by narrowing down the amount of test cases. The following types of image quality problems are common:

- Dust (black spots)
- Lack of sharpness
- Bit errors

Taking and evaluating test pictures

When *taking* a test picture, remember the following:

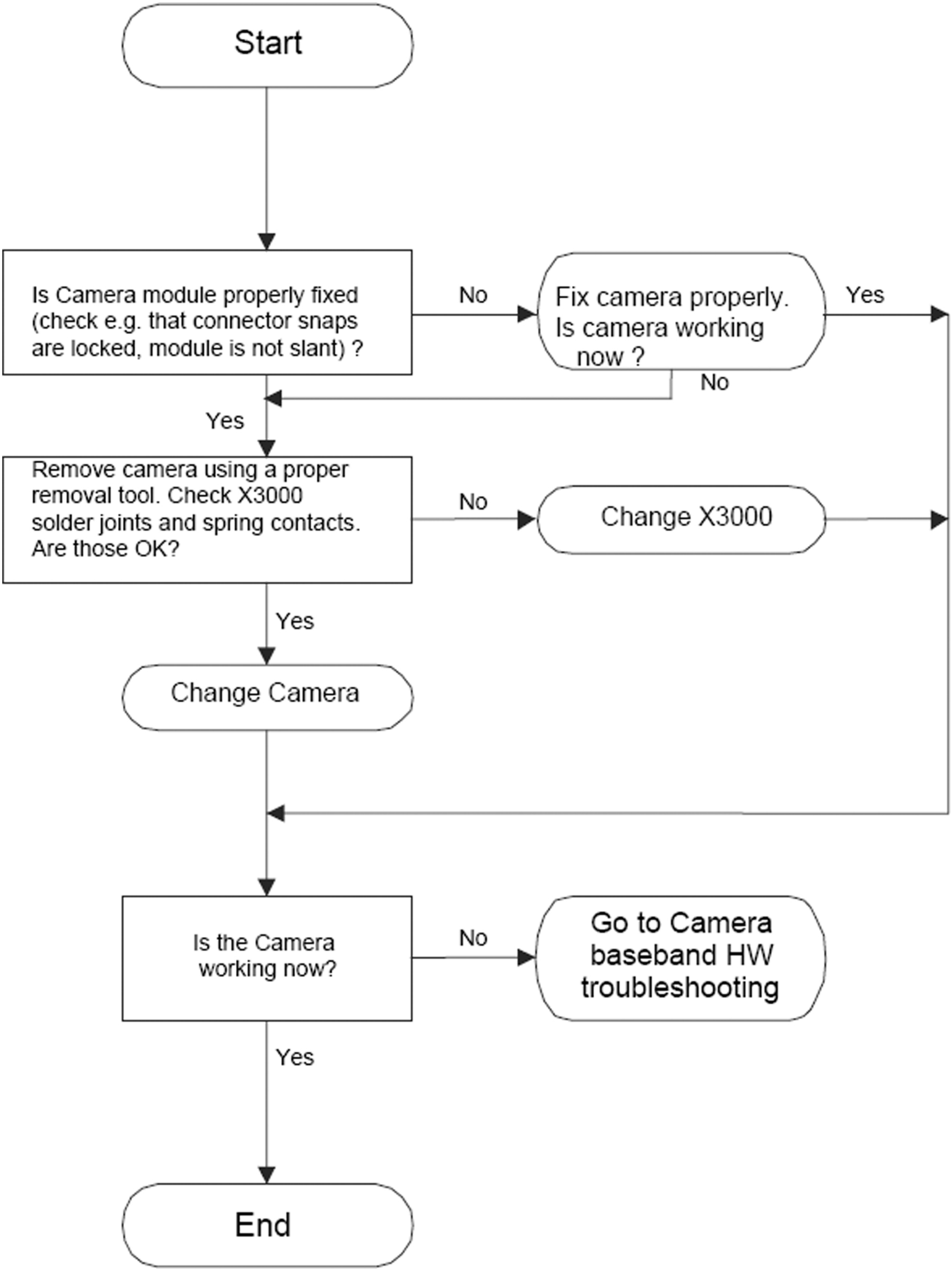
- Avoid bright fluorescent light, 50/60Hz electrical network or high artificial illumination levels
- If the phone is hot, let it rest for a while before taking the picture
- Make sure the optical system is clean
- Use highest possible resolution
- Make sure the light is suffiecient (bright office lightning)
- Do not take the picture towards light source
- Be as still as possible when taking the picture
- Distance should be at least 40cm, 1-2m is recommended

When *evaluating* a test picture, remember the following:

- The center of the picture is sharper than the edges
- The image may be blurred, though it does not show in the viewfinder
- Analyse the picture from your PC monitor, full colour setting is recommended
- If possible, compare with a picture of the same motive taken with a similar Nokia device

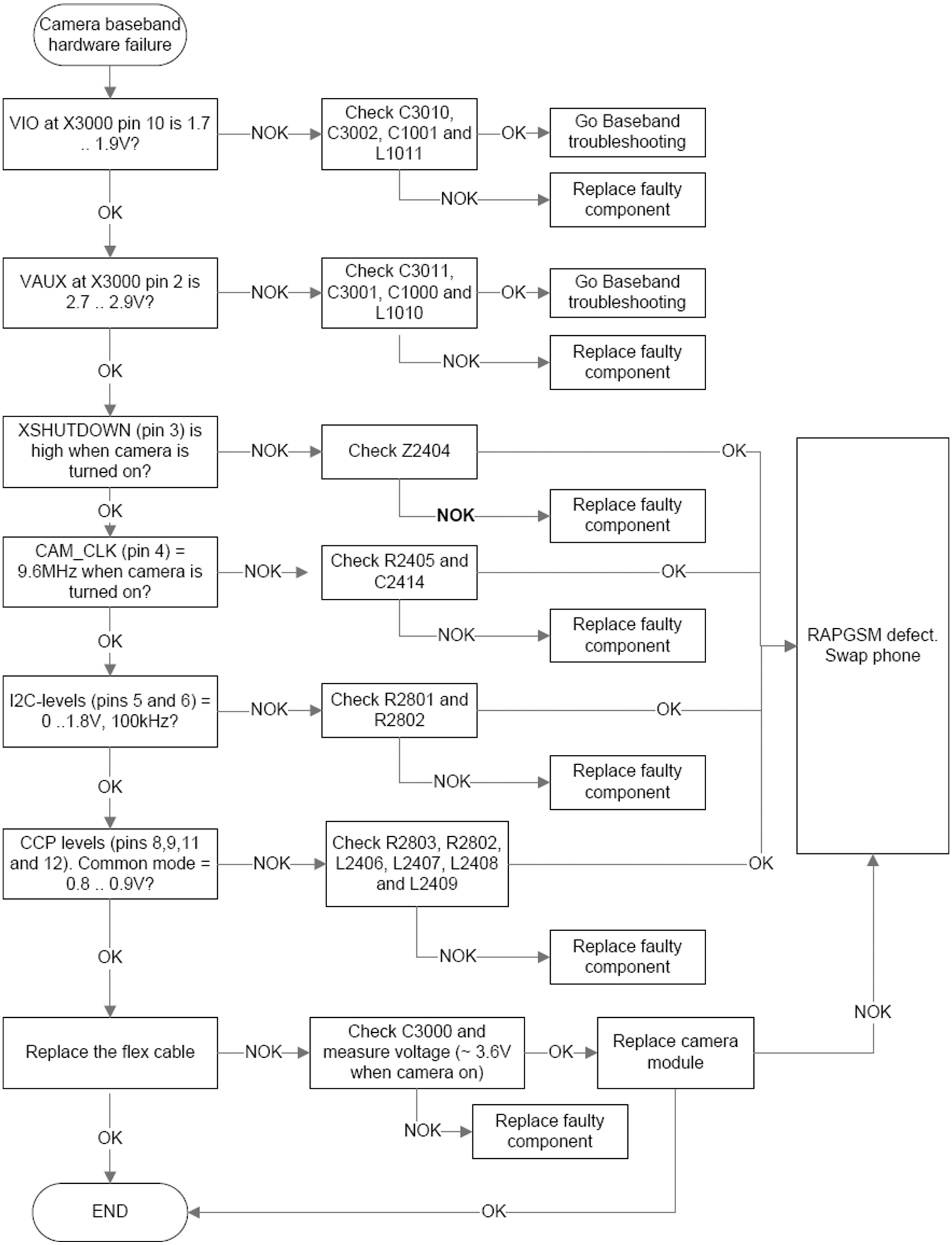
Camera hardware failure message troubleshooting

Troubleshooting flow


Start
Is Camera module properly fixed (check e.g. that connector snaps are locked, module is not slant) ?
No
Fix camera properly. Is camera working now ?
Yes
No
Yes
Remove camera using a proper removal tool. Check X3000 solder joints and spring contacts. Are those OK?
No
Change X3000
Yes
Change Camera
Is the Camera working now?
No
Go to Camera baseband HW troubleshooting
Yes
End

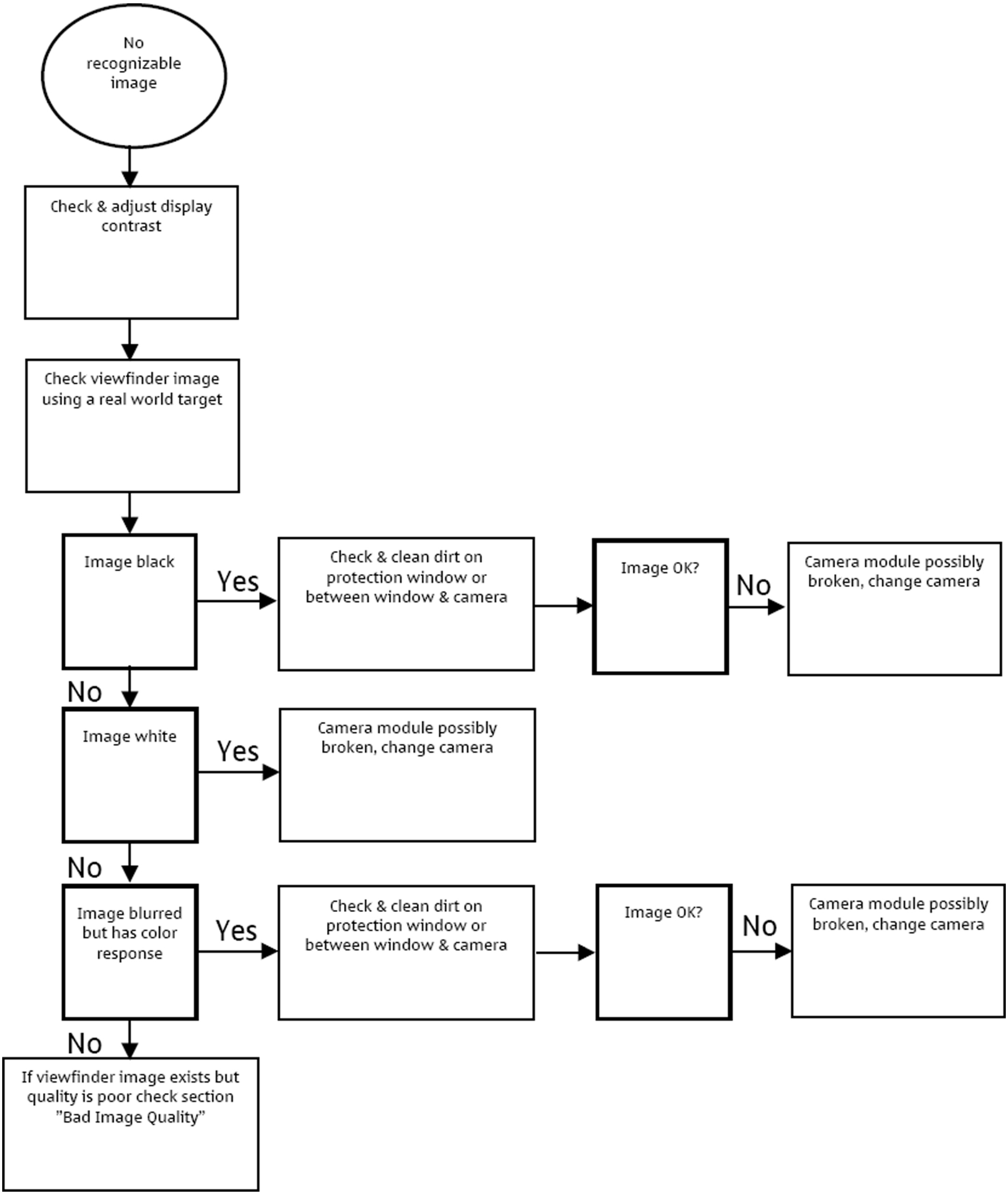
Camera hardware troubleshooting

Camera hardware troubleshooting


Camera baseband hardware failure
VIO at X3000 pin 10 is 1.7 .. 1.9V?
NOK
Check C3010, C3002, C1001 and L1011
OK
Go Baseband troubleshooting
NOK
Replace faulty component
OK
VAUX at X3000 pin 2 is 2.7 .. 2.9V?
NOK
Check C3011, C3001, C1000 and L1010
OK
Go Baseband troubleshooting
NOK
Replace faulty component
OK
XSHUTDOWN (pin 3) is high when camera is turned on?
NOK
Check Z2404
OK
NOK
Replace faulty component
OK
CAM_CLK (pin 4) = 9.6MHz when camera is turned on?
NOK
Check R2405 and C2414
OK
NOK
Replace faulty component
RAPGSM defect. Swap phone
OK
I2C-levels (pins 5 and 6) = 0 ..1.8V, 100kHz?
NOK
Check R2801 and R2802
OK
NOK
Replace faulty component
OK
CCP levels (pins 8,9,11 and 12). Common mode = 0.8 .. 0.9V?
NOK
Check R2803, R2802, L2406, L2407, L2408 and L2409
OK
NOK
Replace faulty component
OK
NOK
Replace the flex cable
NOK
Check C3000 and measure voltage (~ 3.6V when camera on)
OK
Replace camera module
NOK
Replace faulty component
OK
END
OK

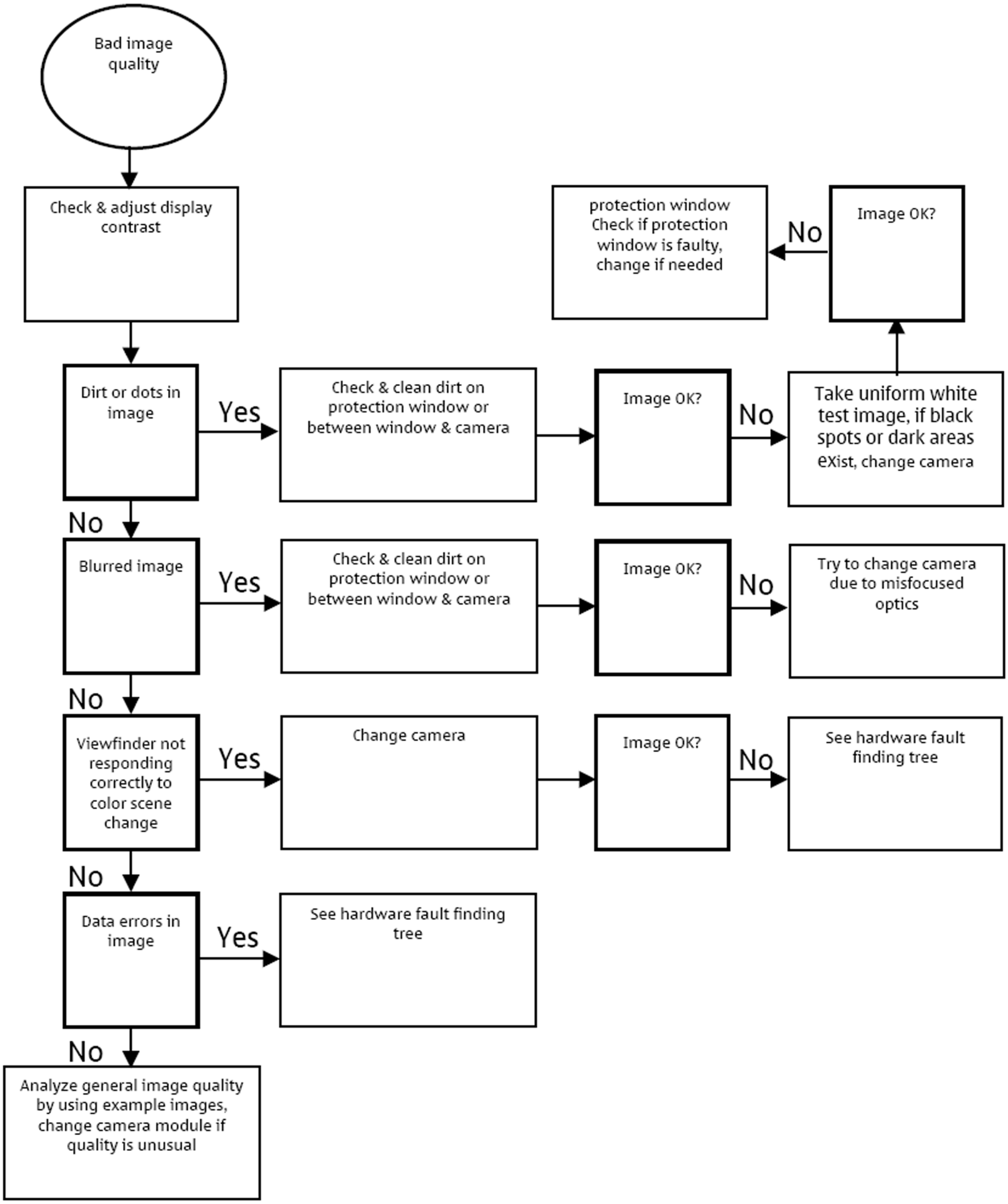
Front camera viewfinder troubleshooting

Troubleshooting flow


No recognizable image
Check & adjust display contrast
Check viewfinder image using a real world target
Image black
Yes
Check & clean dirt on protection window or between window & camera
Image OK?
No
Camera module possibly broken, change camera
No
Image white
Yes
Camera module possibly broken, change camera
No
Image blurred but has color response
Yes
Check & clean dirt on protection window or between window & camera
Image OK?
No
Camera module possibly broken, change camera
No
If viewfinder image exists but quality is poor check section "Bad Image Quality"

Front camera bad image quality troubleshooting

Troubleshooting flow


Bad image quality
Check & adjust display contrast
Dirt or dots in image
Yes
Check & clean dirt on protection window or between window & camera
Image OK?
No
Take uniform white test image, if black spots or dark areas exist, change camera
Image OK?
No
protection window Check if protection window is faulty, change if needed
No
Blurred image
Yes
Check & clean dirt on protection window or between window & camera
Image OK?
No
Try to change camera due to misfocused optics
No
Viewfinder not responding correctly to color scene change
Yes
Change camera
Image OK?
No
See hardware fault finding tree
No
Data errors in image
Yes
See hardware fault finding tree
No
Analyze general image quality by using example images, change camera module if quality is unusual

Bluetooth troubleshooting

Introduction to Bluetooth/FM Radio troubleshooting

There are two main Bluetooth problems that can occur:

Problem	Description
Detachment of the BT antenna.	This would most likely happen if the device has been dropped repeatedly to the ground. It could cause the BT antenna to become loose or partially detached from the PWB. (see next page for details about BT antenna HW and Mechanics)
A malfunction in the BT ASIC, BB ASICs or Phone’s BT SMD components.	This is unpredictable and could have many causes i.e. SW or HW related.

The main issue is to find out if the problem is related to the BT antenna or related to the BT system or the phone’s BB and then replace/fix the faulty component.

Bluetooth/FM Radio component layout

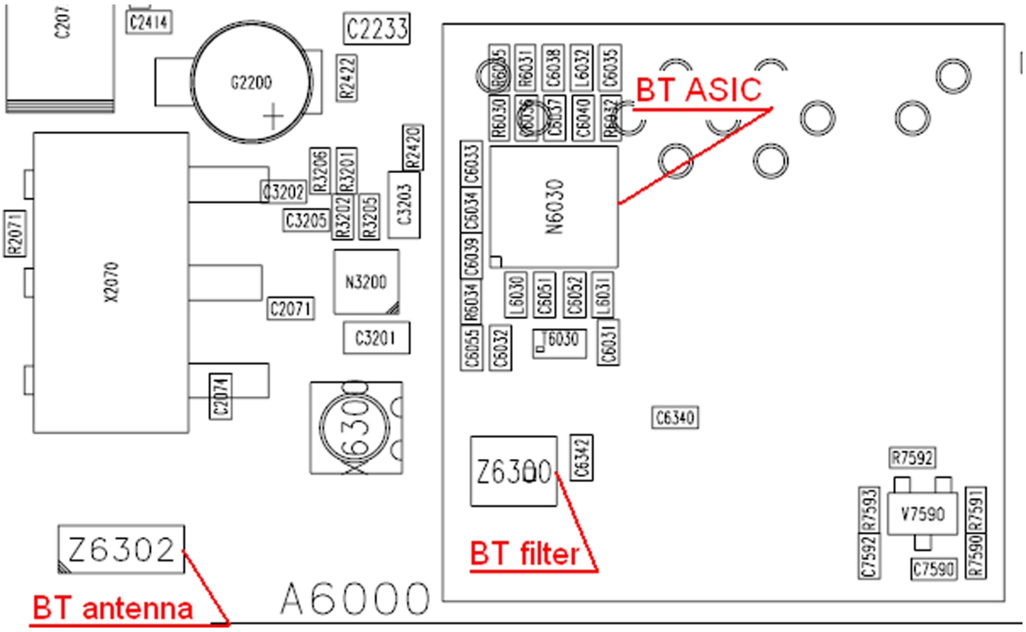

C207
C2414
C2233
G2200
R2422
R2420
R2071
X2070
R3206
R3201
C3202
C3205
R3202
R3203
C3203
N3200
C2071
C3201
C2074
Z6302
BT antenna
A6000
R6035
R6031
C6038
L6032
C6035
R6030
R6036
C6037
C6040
R6032
BT ASIC
C6033
C6034
C6039
R6034
C6055
N6030
L6030
C6051
C6052
L6031
C6032
T6030
C6031
C6340
Z6300
C6342
BT filter
R7592
C7592
R7593
V7590
C7590
R7590
R7591

Figure 40 RM-198 Bluetooth

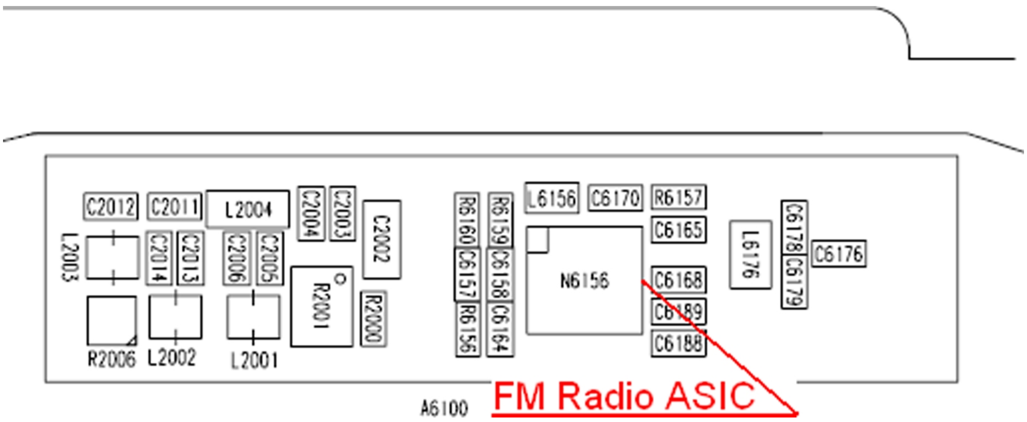

C2012
C2011
L2004
C2004
C2003
C2002
L2003
C2014
C2013
C2006
C2005
R2001
R2000
R2006
L2002
L2001
R6160
R6159
C6157
C6158
R6156
C6164
L6156
C6170
R6157
C6165
N6156
C6168
C6189
C6188
L6176
C6178
C6179
C6176
A6100
FM Radio ASIC

Figure 41 RM-198 FM radio

Bluetooth settings for Phoenix

Steps

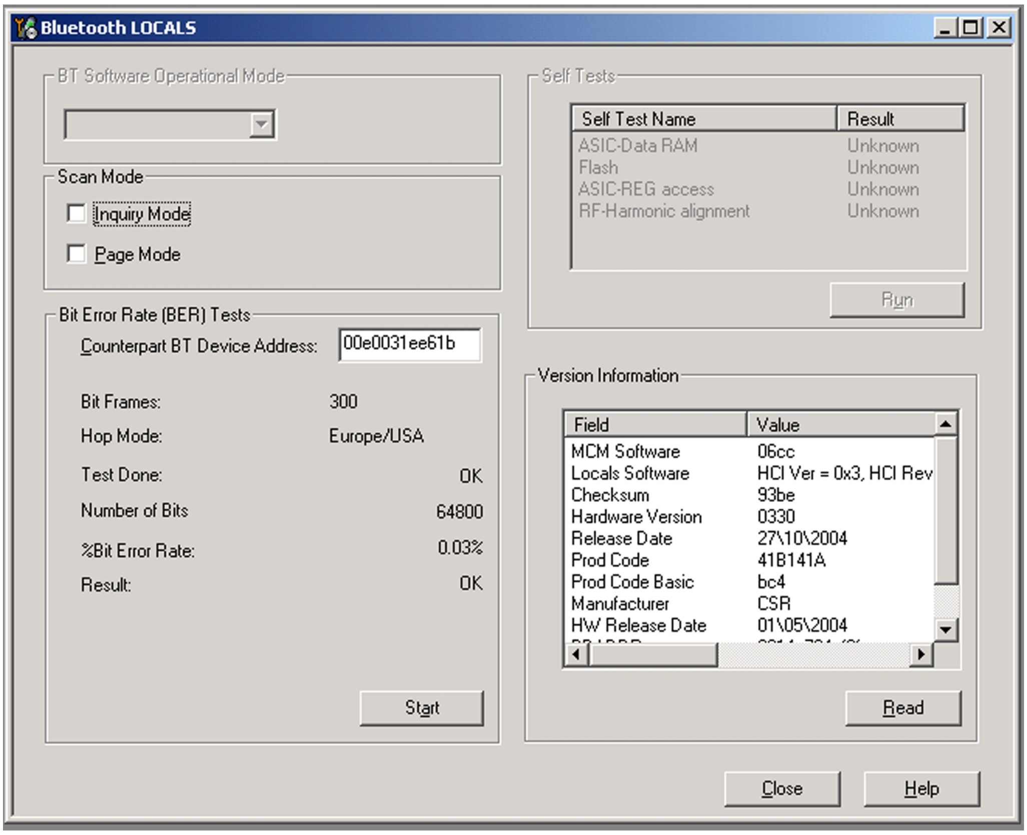
1. Start *Phoenix* service software.
2. From the **File** menu, choose **Open Product**, and then choose the correct type designator from the **Product** list.
3. Place the phone to a flash adapter in the local mode.
4. Choose **Testing→Bluetooth LOCALS** .
5. Locate JBT-9's serial number (12 digits) found in the type label on the back of JBT-9.

   In addition to JBT-9, also SB-6, JBT-3 and JBT-6 Bluetooth test boxes can be used.
6. In the *Bluetooth LOCALS* window, write the 12-digit serial number on the **Counterpart BT Device Address** line.

   This needs to be done only once provided that JBT-9 is not changed.
7. Place the JBT-9 box near (within 10 cm) the BT antenna and click **Run BER Test**.

Results

Bit Error Rate test result is displayed in the *Bit Error Rate (BER) Tests* pane in the *Bluetooth LOCALS* window.


Bluetooth LOCALS
BT Software Operational Mode
Scan Mode
Self Tests
Run
Version Information
Start
Read
Close
Help

☐ Inquiry Mode

☐ Page Mode

Bit Error Rate (BER) Tests

Counterpart BT Device Address: 00e0031ee61b

Bit Frames: 300

Hop Mode: Europe/USA

Test Done: OK

Number of Bits: 64800

%Bit Error Rate: 0.03%

Result: OK

Self Test Name	Result
ASIC-Data RAM	Unknown
Flash	Unknown
ASIC-REG access	Unknown
RF-Harmonic alignment	Unknown

Field	Value
MCM Software	06cc
Locals Software	HCI Ver = 0x3, HCI Rev
Checksum	93be
Hardware Version	0330
Release Date	27\10\2004
Prod Code	41B141A
Prod Code Basic	bc4
Manufacturer	CSR
HW Release Date	01\05\2004

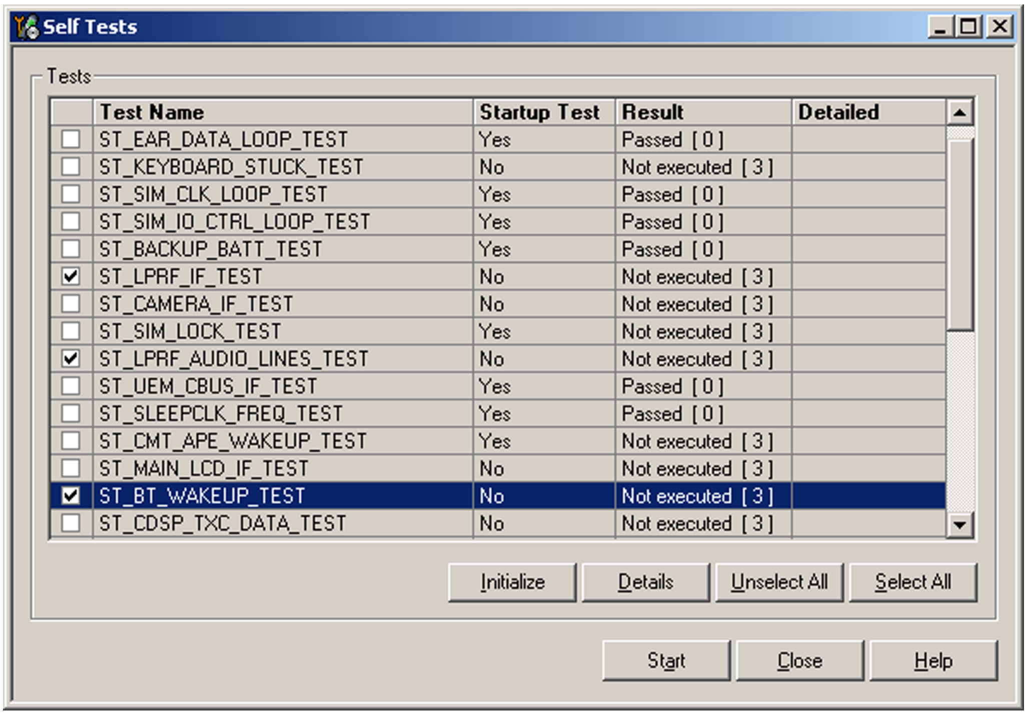
Figure 42 BER test result

Bluetooth self tests in Phoenix

Steps

1. Start *Phoenix* service software.
2. Choose**File→Scan Product.**
3. Place the phone to a flash adapter.
4. From the **Mode** drop-down menu, set mode to **Local**.
5. Choose **Testing→Self Tests.**
6. In the *Self Tests* window check the following Bluetooth related tests:
    - **ST_LPRF_IF_TEST**
    - **ST_LPRF_AUDIO_LINES_TEST**
    - **ST_BT_WAKEUP_TEST**

7. To run the tests, click **Start**.

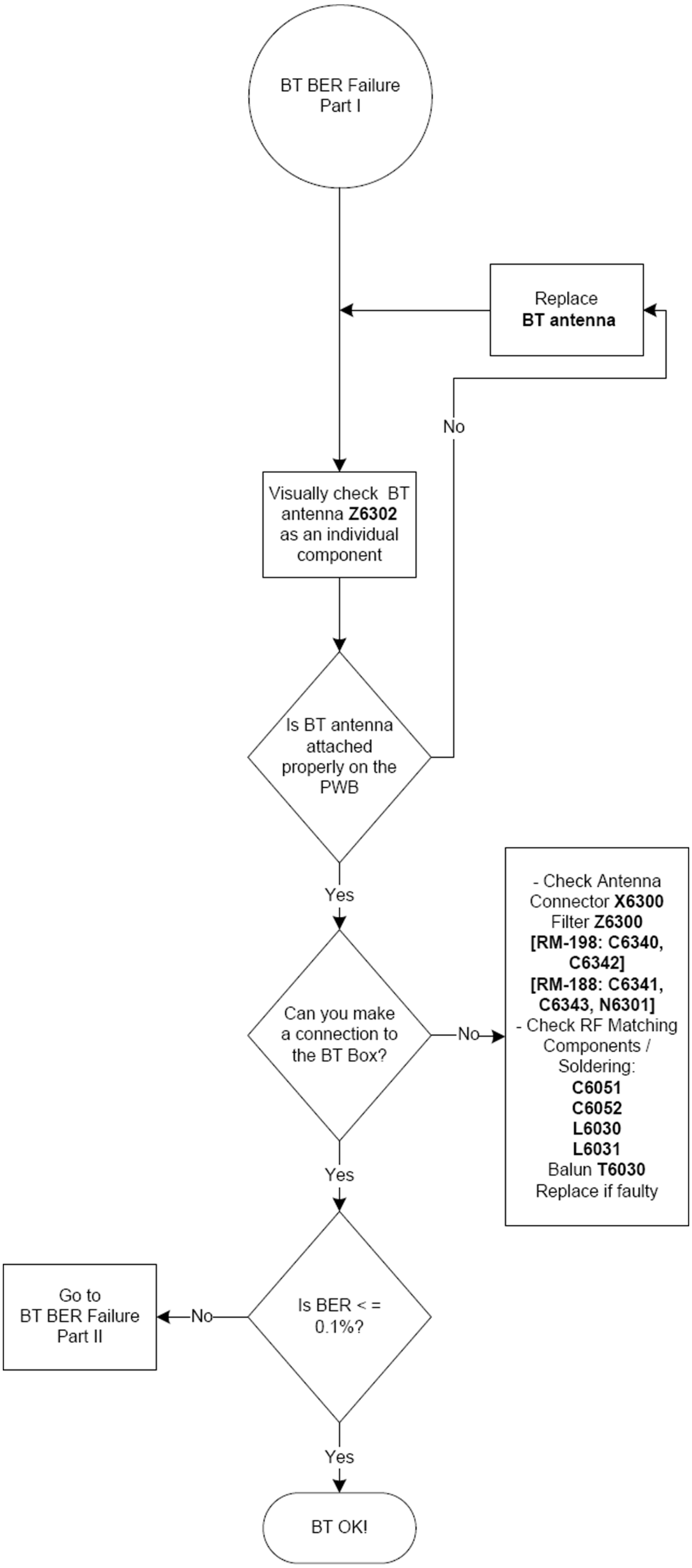


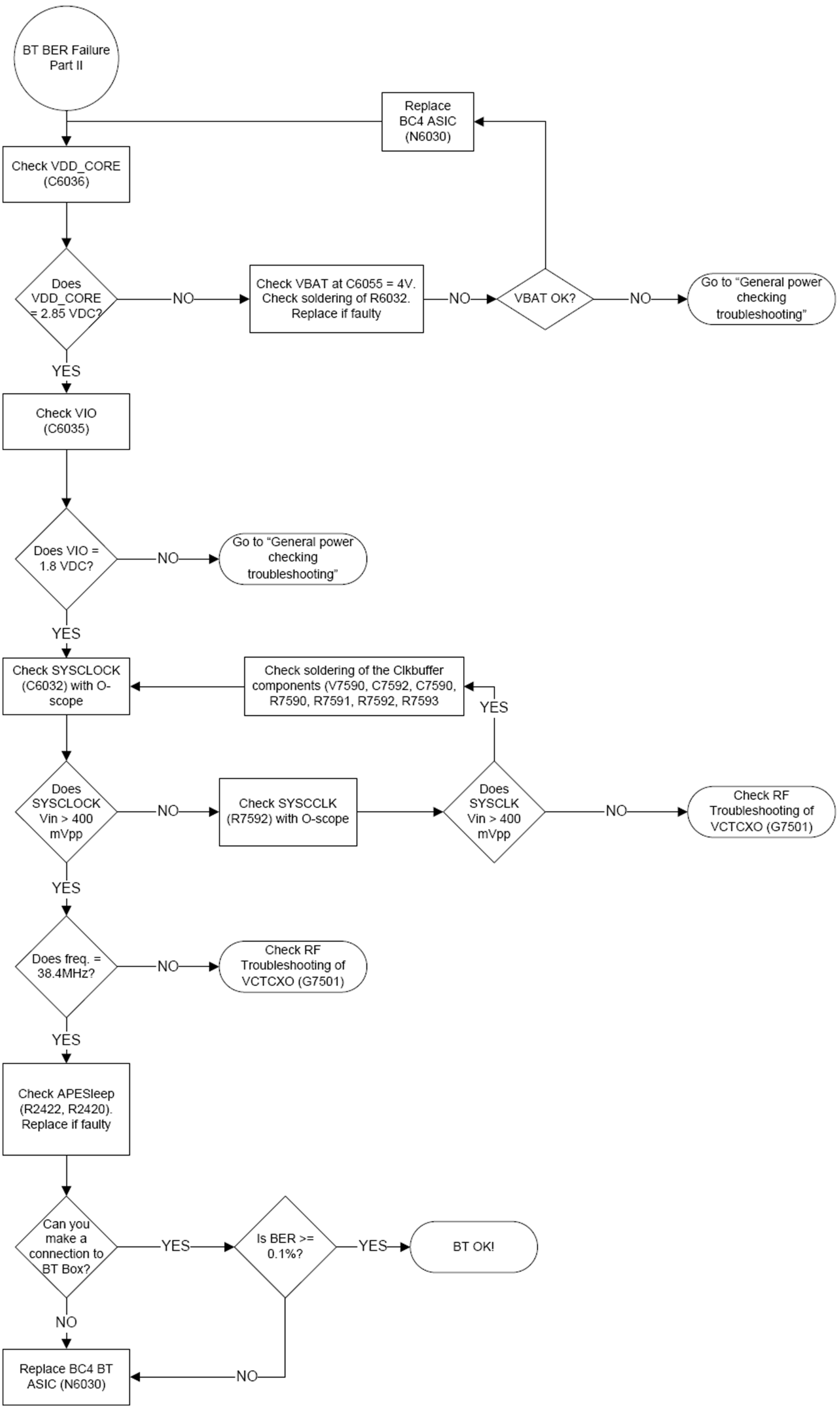
	Test Name	Startup Test	Result	Detailed
☐	ST_EAR_DATA_LOOP_TEST	Yes	Passed [0]	
☐	ST_KEYBOARD_STUCK_TEST	No	Not executed [3]	
☐	ST_SIM_CLK_LOOP_TEST	Yes	Passed [0]	
☐	ST_SIM_IO_CTRL_LOOP_TEST	Yes	Passed [0]	
☐	ST_BACKUP_BATT_TEST	Yes	Passed [0]	
☑	ST_LPRF_IF_TEST	No	Not executed [3]	
☐	ST_CAMERA_IF_TEST	No	Not executed [3]	
☐	ST_SIM_LOCK_TEST	Yes	Not executed [3]	
☑	ST_LPRF_AUDIO_LINES_TEST	No	Not executed [3]	
☐	ST_UEM_CBUS_IF_TEST	Yes	Passed [0]	
☐	ST_SLEEPCLK_FREQ_TEST	Yes	Passed [0]	
☐	ST_CMT_APE_WAKEUP_TEST	Yes	Not executed [3]	
☐	ST_MAIN_LCD_IF_TEST	No	Not executed [3]	
☑	ST_BT_WAKEUP_TEST	No	Not executed [3]	
☐	ST_CDSP_TXC_DATA_TEST	No	Not executed [3]	

Figure 43 Bluetooth self tests in *Phoenix*

Bluetooth BER failure troubleshooting

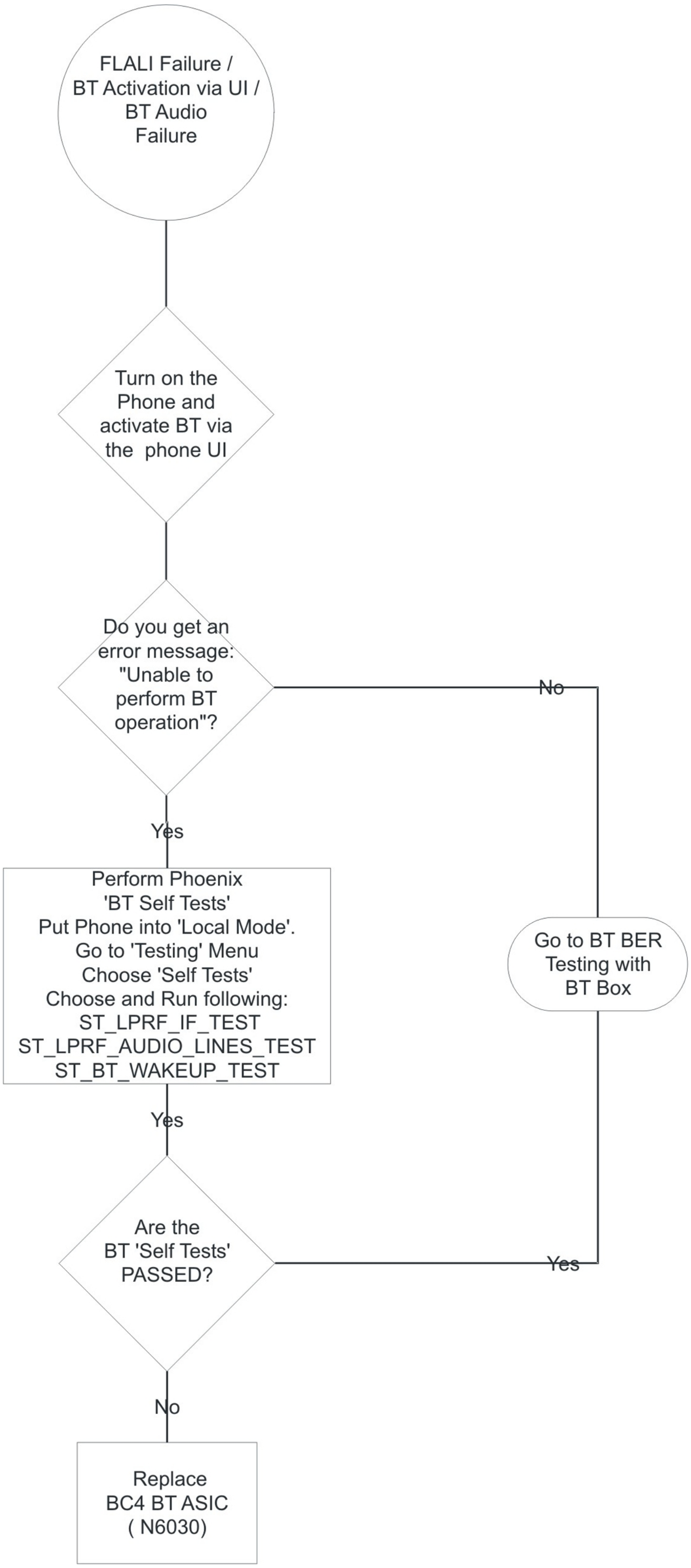
Troubleshooting flow


BT BER Failure Part I
Replace **BT antenna**
No
Visually check BT antenna **Z6302** as an individual component
Is BT antenna attached properly on the PWB
Yes
Can you make a connection to the BT Box?
No
- Check Antenna Connector **X6300** Filter **Z6300** **[RM-198: C6340, C6342]** **[RM-188: C6341, C6343, N6301]**
- Check RF Matching Components / Soldering: **C6051** **C6052** **L6030** **L6031** Balun **T6030** Replace if faulty
Yes
Go to BT BER Failure Part II
No
Is BER < = 0.1%?
Yes
BT OK!


BT BER Failure Part II
Replace BC4 ASIC (N6030)
Check VDD_CORE (C6036)
Does VDD_CORE = 2.85 VDC?
NO
Check VBAT at C6055 = 4V. Check soldering of R6032. Replace if faulty
NO
VBAT OK?
NO
Go to "General power checking troubleshooting"
YES
Check VIO (C6035)
Does VIO = 1.8 VDC?
NO
Go to "General power checking troubleshooting"
YES
Check SYSCLOCK (C6032) with O-scope
Check soldering of the Clkbuffer components (V7590, C7592, C7590, R7590, R7591, R7592, R7593
YES
Does SYSCLOCK Vin > 400 mVpp
NO
Check SYSCCLK (R7592) with O-scope
Does SYSCLK Vin > 400 mVpp
NO
Check RF Troubleshooting of VCTCXO (G7501)
YES
Does freq. = 38.4MHz?
NO
Check RF Troubleshooting of VCTCXO (G7501)
YES
Check APESleep (R2422, R2420). Replace if faulty
Can you make a connection to BT Box?
YES
Is BER >= 0.1%?
YES
BT OK!
NO
Replace BC4 BT ASIC (N6030)
NO

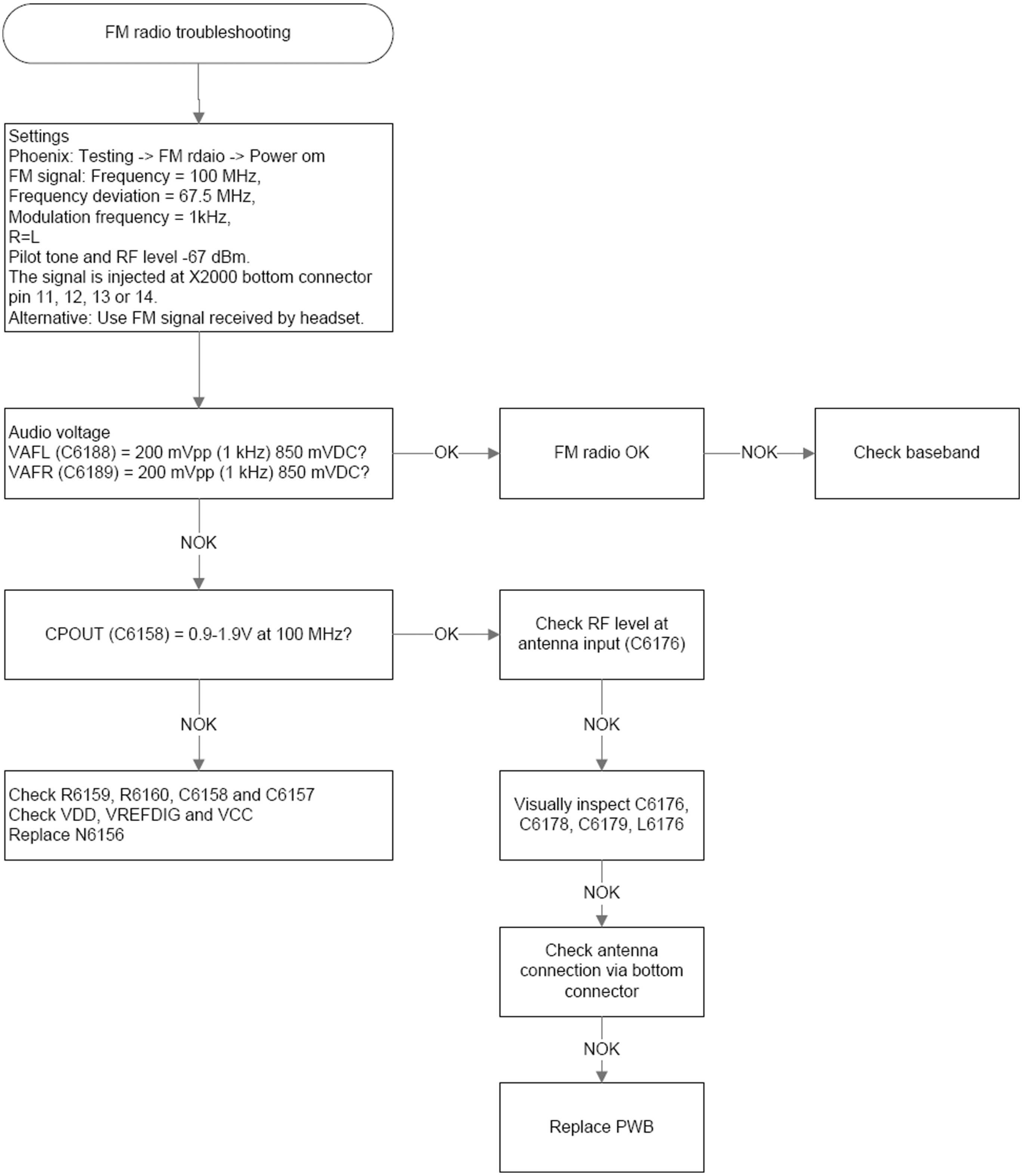
BT audio failure troubleshooting

Troubleshooting flow


FLALI Failure / BT Activation via UI / BT Audio Failure
Turn on the Phone and activate BT via the phone UI
Do you get an error message: "Unable to perform BT operation"?
No
Yes
Perform Phoenix 'BT Self Tests' Put Phone into 'Local Mode'. Go to 'Testing' Menu Choose 'Self Tests' Choose and Run following: ST_LPRF_IF_TEST ST_LPRF_AUDIO_LINES_TEST ST_BT_WAKEUP_TEST
Go to BT BER Testing with BT Box
Yes
Are the BT 'Self Tests' PASSED?
Yes
No
Replace BC4 BT ASIC (N6030)

FM Radio troubleshooting

Troubleshooting flow


FM radio troubleshooting
Settings
Phoenix: Testing -> FM rdaio -> Power om
FM signal: Frequency = 100 MHz,
Frequency deviation = 67.5 MHz,
Modulation frequency = 1kHz,
R=L
Pilot tone and RF level -67 dBm.
The signal is injected at X2000 bottom connector pin 11, 12, 13 or 14.
Alternative: Use FM signal received by headset.
Audio voltage
VAFL (C6188) = 200 mVpp (1 kHz) 850 mVDC?
VAFR (C6189) = 200 mVpp (1 kHz) 850 mVDC?
OK
FM radio OK
NOK
Check baseband
NOK
CPOUT (C6158) = 0.9-1.9V at 100 MHz?
OK
Check RF level at antenna input (C6176)
NOK
Check R6159, R6160, C6158 and C6157
Check VDD, VREFDIG and VCC
Replace N6156
NOK
Visually inspect C6176, C6178, C6179, L6176
NOK
Check antenna connection via bottom connector
NOK
Replace PWB

Audio troubleshooting

Audio troubleshooting test instructions

Differential external earpiece and internal earpiece outputs can be measured either with a single-ended or a differential probe.

When measuring with a single-ended probe each output is measured against the ground.

Internal handsfree output is measured using a current probe, if a special low-pass filter designed for measuring a digital amplifier is not available. Note also that when using a current probe, the input signal frequency must be set to 2kHz.

The input signal for each loop test can be either single-ended or differential.

Required equipment

The following equipment is needed for the tests:

- Oscilloscope
- Function generator (sine waveform)
- Current probe (Internal handsfree PWM output measurement)
- Phoenix service software
- Battery voltage 3.7V

Test procedure

Audio can be tested using the Phoenix audio routings option. Three different audio loop paths can be activated:

- External microphone to Internal earpiece
- External microphone to Internal handsfree speaker
- Internal microphone to External earpiece

Each audio loop sets routing from the specified input to the specified output enabling a quick in-out test. Loop path gains are fixed and they cannot be changed using Phoenix. Correct pins and signals for each test are presented in the following table.

Phoenix audio loop tests and test results

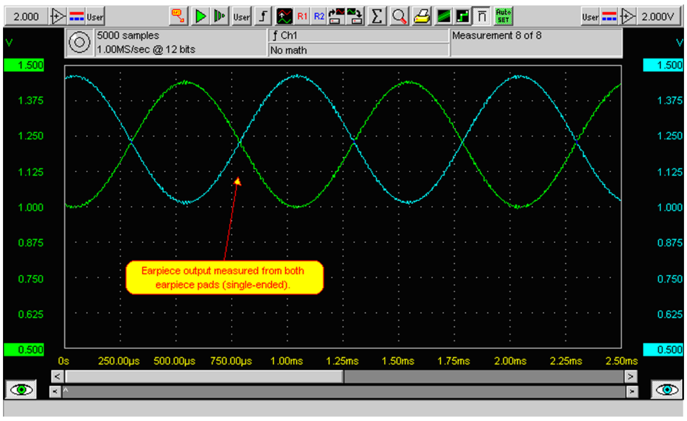
The results presented in the table apply when no accessory is connected and battery voltage is set to 3.7V.

Earpiece, internal microphone and speaker are in place during measurement. Applying a headset accessory during measurement causes a significant drop in measured quantities.

The gain values presented in the table apply for a differential output vs. single-ended/differential input.

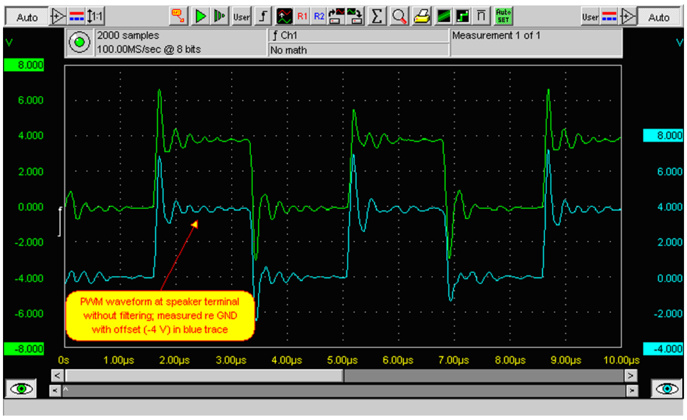
Loop test	Input terminal	Output terminal	Path gain [dB] (fixed)	Input voltage [mVp-p]	Differential output voltage [mVp-p]	Output DC level [V]	Output current [mA]
External Mic to External Earpiece	XMICP and GND	HSEAR R P, HSEAR R N and GND	-2.9	1000	720	1.2	NA
		HSEAR P, HSEAR N and GND					
	XMICN and GND	HSEAR R P, HSEAR R N and GND					
		HSEAR P, HSEAR N and GND					
External Mic to Internal Earpiece	XMICP and GND	EarP and GND	-4.5	1000	600	1.2	NA
		EarN and GND					
	XMICN and GND	EarP and GND					
		EarN and GND					
External Mic to Internal handsfree	XMICP and GND	B2102 pads	-5	1000	560	0	25mA (calc.)
	XMICN and GND	B2102 pads					
Internal Mic to External Earpiece	B2100 (OUT/ GND)	HSEAR R P, HSEAR R N and GND	22.7	100	1360	1.2	NA
		HSEAR P, HSEAR N and GND					
		HSEAR R P, HSEAR R N and GND					
		HSEAR P, HSEAR N and GND					

Measurement data



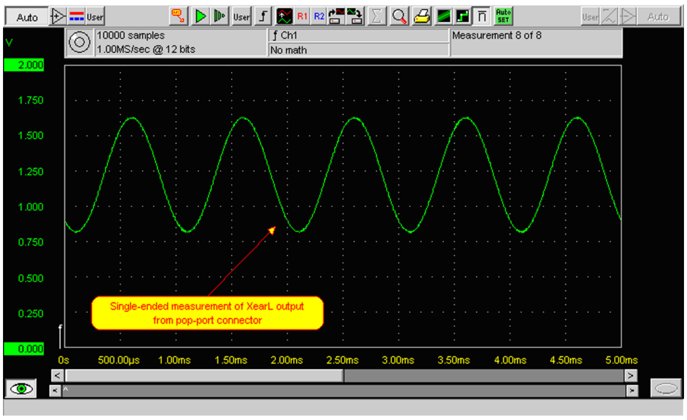
Earpiece output measured from both earpiece pads (single-ended).

Figure 44 Single-ended output waveform of the Ext_in_HP_out measurement when earpiece is connected.



PWM waveform at speaker terminal without filtering, measured re GND with offset (-4 V) in blue trace

Figure 45 Differential output waveform of the Ext_in_IHF_out out loop measurement when speaker is connected.

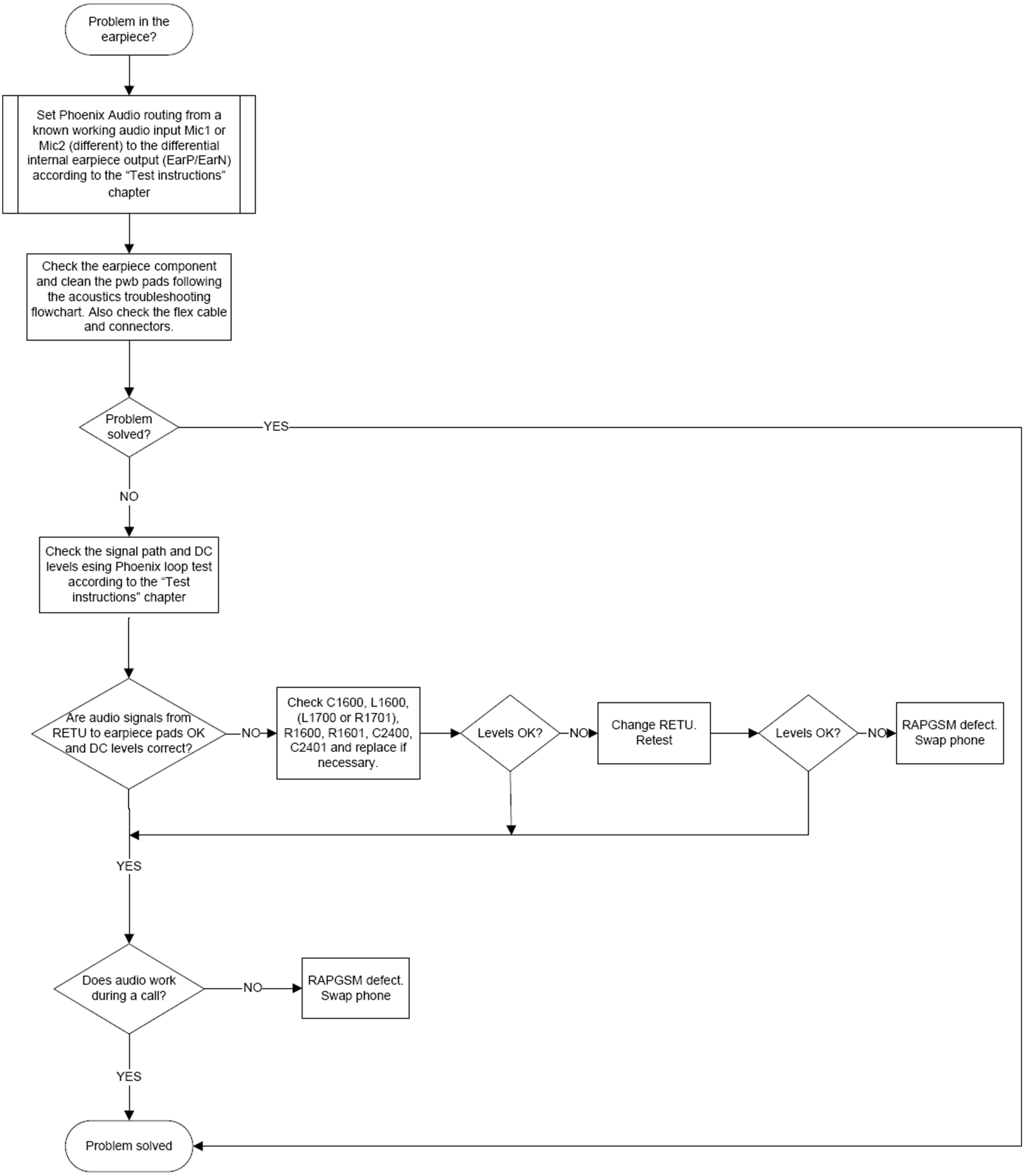


Single-ended measurement of XearL output from pop-port connector

Figure 46 Single-ended output waveform of the HP_in_Ext_out loop when microphone is connected.

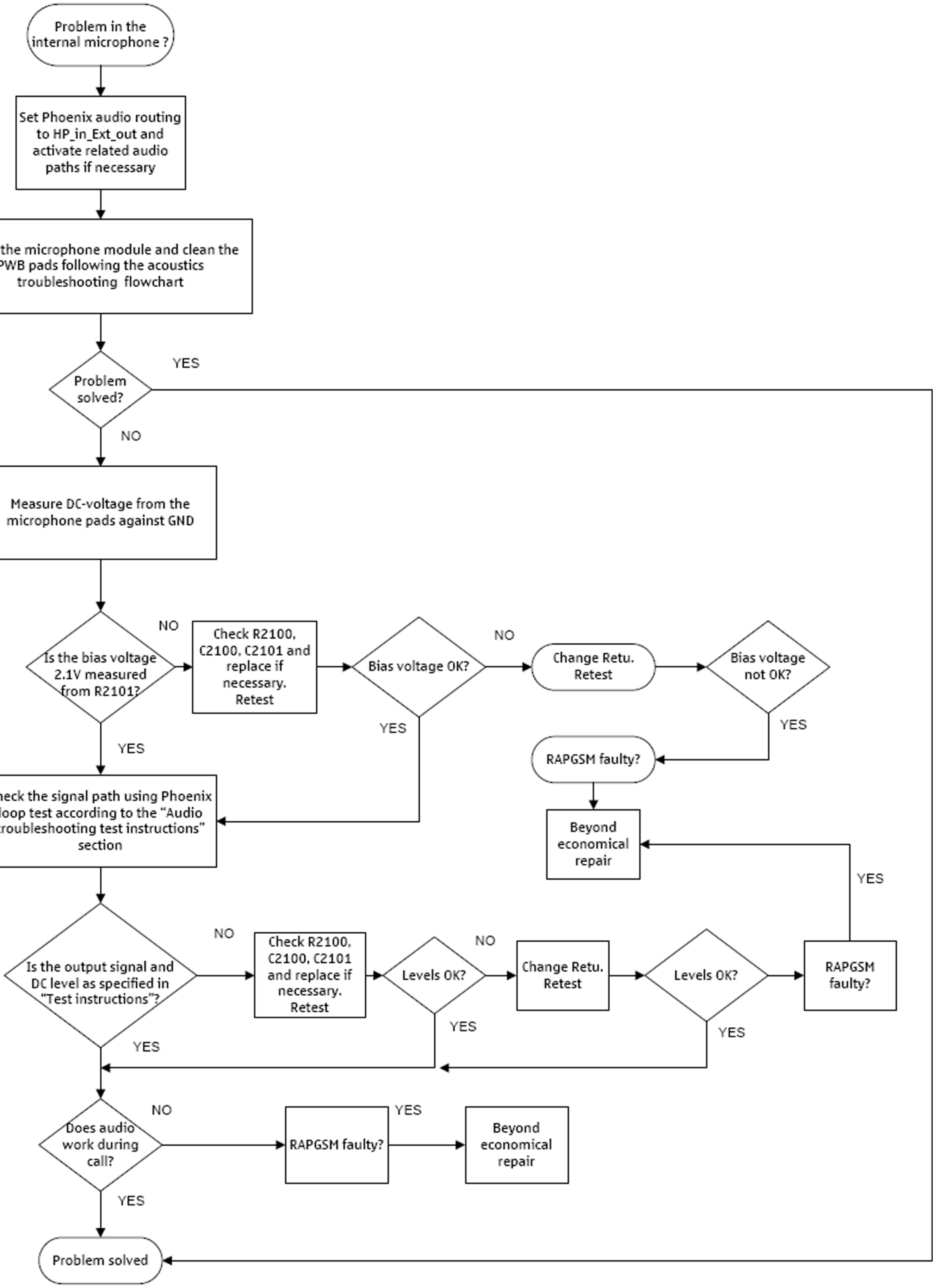
Internal earpiece troubleshooting

Troubleshooting flow


Problem in the earpiece?
Set Phoenix Audio routing from a known working audio input Mic1 or Mic2 (different) to the differential internal earpiece output (EarP/EarN) according to the "Test instructions" chapter
Check the earpiece component and clean the pwb pads following the acoustics troubleshooting flowchart. Also check the flex cable and connectors.
Problem solved?
YES
NO
Check the signal path and DC levels esing Phoenix loop test according to the "Test instructions" chapter
Are audio signals from RETU to earpiece pads OK and DC levels correct?
NO
Check C1600, L1600, (L1700 or R1701), R1600, R1601, C2400, C2401 and replace if necessary.
Levels OK?
NO
Change RETU. Retest
Levels OK?
NO
RAPGSM defect. Swap phone
YES
Does audio work during a call?
NO
RAPGSM defect. Swap phone
YES
Problem solved

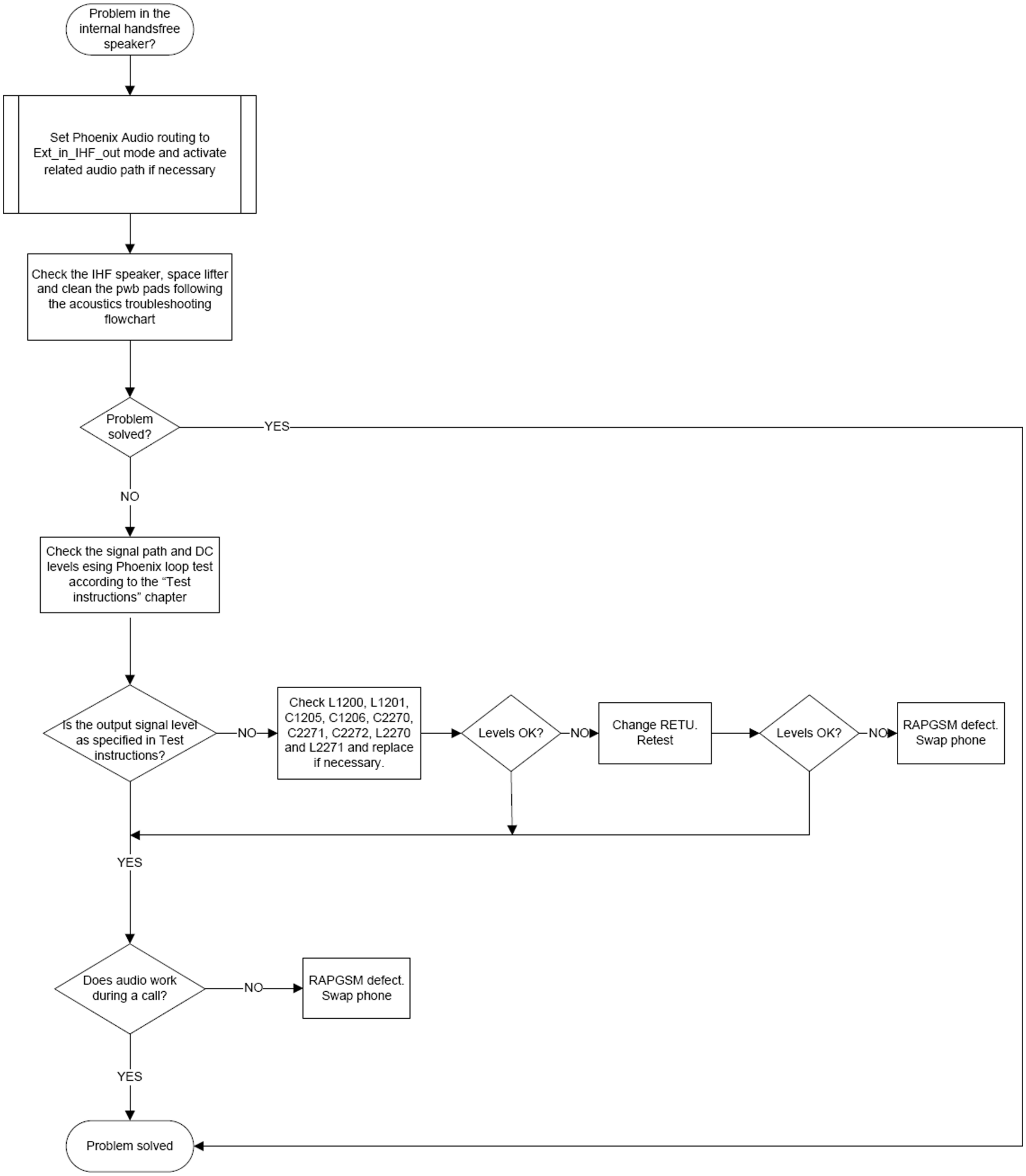
Internal microphone troubleshooting

Troubleshooting flow


Problem in the internal microphone ?
Set Phoenix audio routing to HP_in_Ext_out and activate related audio paths if necessary
Check the microphone module and clean the PWB pads following the acoustics troubleshooting flowchart
Problem solved?
YES
NO
Measure DC-voltage from the microphone pads against GND
Is the bias voltage 2.1V measured from R2101?
NO
Check R2100, C2100, C2101 and replace if necessary. Retest
Bias voltage OK?
NO
Change Retu. Retest
Bias voltage not OK?
YES
YES
RAPGSM faulty?
Beyond economical repair
YES
Check the signal path using Phoenix loop test according to the "Audio troubleshooting test instructions" section
Is the output signal and DC level as specified in "Test instructions"?
NO
Check R2100, C2100, C2101 and replace if necessary. Retest
Levels OK?
NO
Change Retu. Retest
Levels OK?
RAPGSM faulty?
YES
YES
YES
YES
Does audio work during call?
NO
RAPGSM faulty?
YES
Beyond economical repair
YES
Problem solved

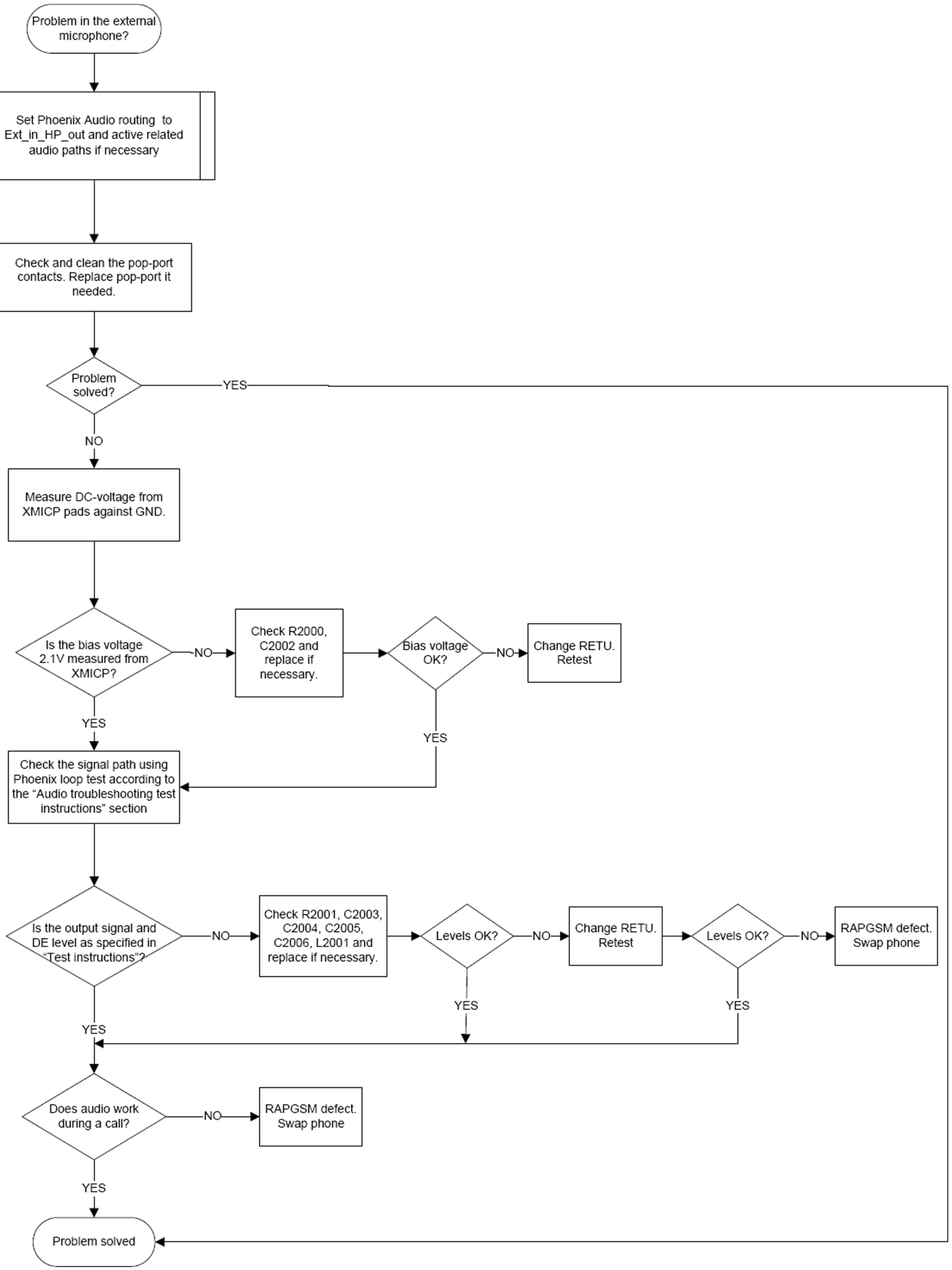
IHF speaker troubleshooting

Troubleshooting flow


Problem in the internal handsfree speaker?
Set Phoenix Audio routing to Ext_in_IHF_out mode and activate related audio path if necessary
Check the IHF speaker, space lifter and clean the pwb pads following the acoustics troubleshooting flowchart
Problem solved?
YES
NO
Check the signal path and DC levels esing Phoenix loop test according to the "Test instructions" chapter
Is the output signal level as specified in Test instructions?
NO
Check L1200, L1201, C1205, C1206, C2270, C2271, C2272, L2270 and L2271 and replace if necessary.
Levels OK?
NO
Change RETU. Retest
Levels OK?
NO
RAPGSM defect. Swap phone
YES
Does audio work during a call?
NO
RAPGSM defect. Swap phone
YES
Problem solved

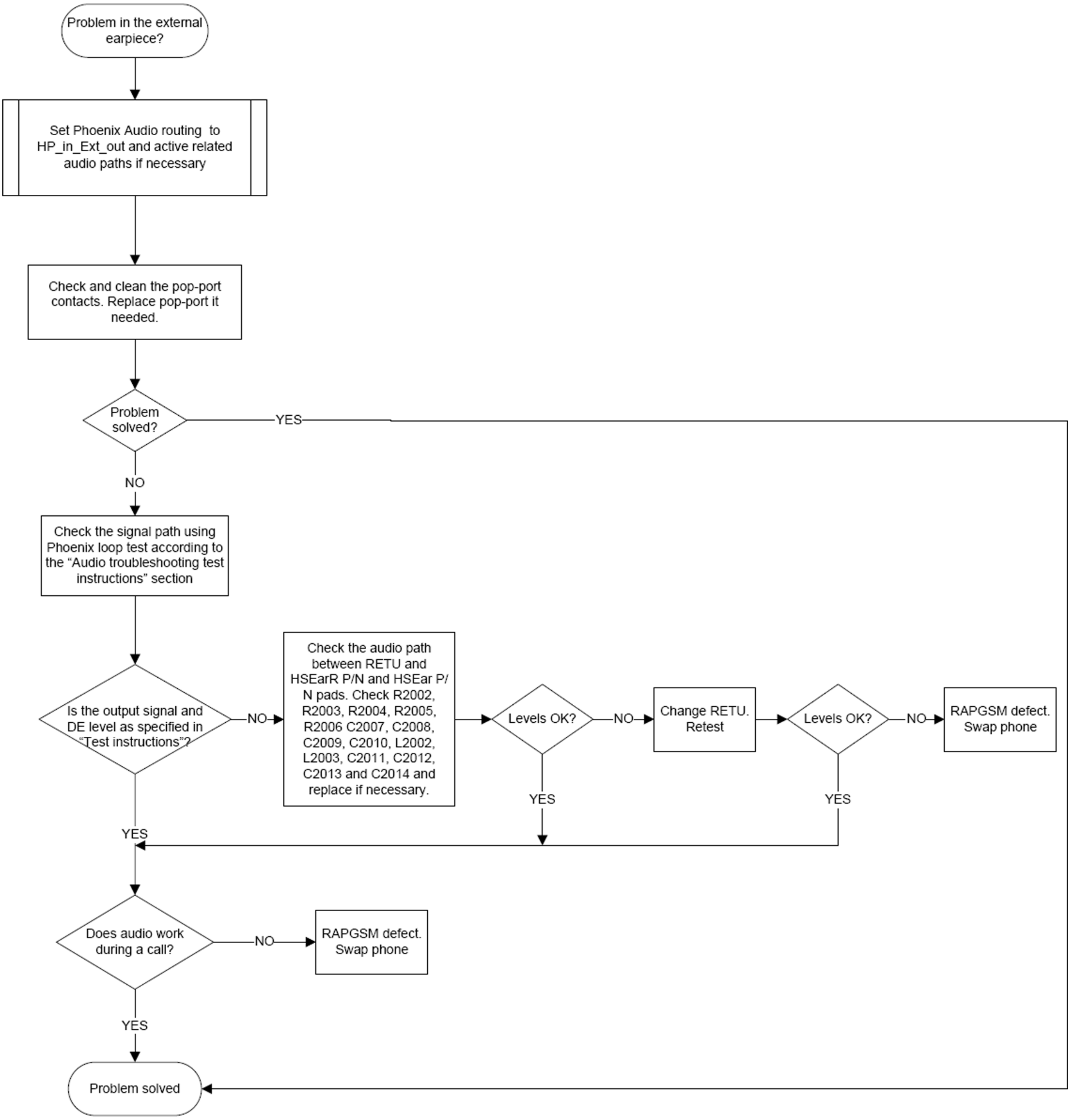
External microphone troubleshooting

Troubleshooting flow


Problem in the external microphone?
Set Phoenix Audio routing to Ext_in_HP_out and active related audio paths if necessary
Check and clean the pop-port contacts. Replace pop-port it needed.
Problem solved?
YES
NO
Measure DC-voltage from XMICP pads against GND.
Is the bias voltage 2.1V measured from XMICP?
NO
Check R2000, C2002 and replace if necessary.
Bias voltage OK?
NO
Change RETU. Retest
YES
YES
Check the signal path using Phoenix loop test according to the "Audio troubleshooting test instructions" section
Is the output signal and DE level as specified in "Test instructions"?
NO
Check R2001, C2003, C2004, C2005, C2006, L2001 and replace if necessary.
Levels OK?
NO
Change RETU. Retest
Levels OK?
NO
RAPGSM defect. Swap phone
YES
YES
YES
Does audio work during a call?
NO
RAPGSM defect. Swap phone
YES
Problem solved

External earpiece troubleshooting

Troubleshooting flow


Problem in the external earpiece?
Set Phoenix Audio routing to HP_in_Ext_out and active related audio paths if necessary
Check and clean the pop-port contacts. Replace pop-port it needed.
Problem solved?
YES
NO
Check the signal path using Phoenix loop test according to the "Audio troubleshooting test instructions" section
Is the output signal and DE level as specified in "Test instructions"?
NO
Check the audio path between RETU and HSEarR P/N and HSEar P/N pads. Check R2002, R2003, R2004, R2005, R2006 C2007, C2008, C2009, C2010, L2002, L2003, C2011, C2012, C2013 and C2014 and replace if necessary.
Levels OK?
NO
Change RETU. Retest
Levels OK?
NO
RAPGSM defect. Swap phone
YES
YES
YES
Does audio work during a call?
NO
RAPGSM defect. Swap phone
YES
Problem solved

Introduction to acoustics troubleshooting

Acoustics troubleshooting

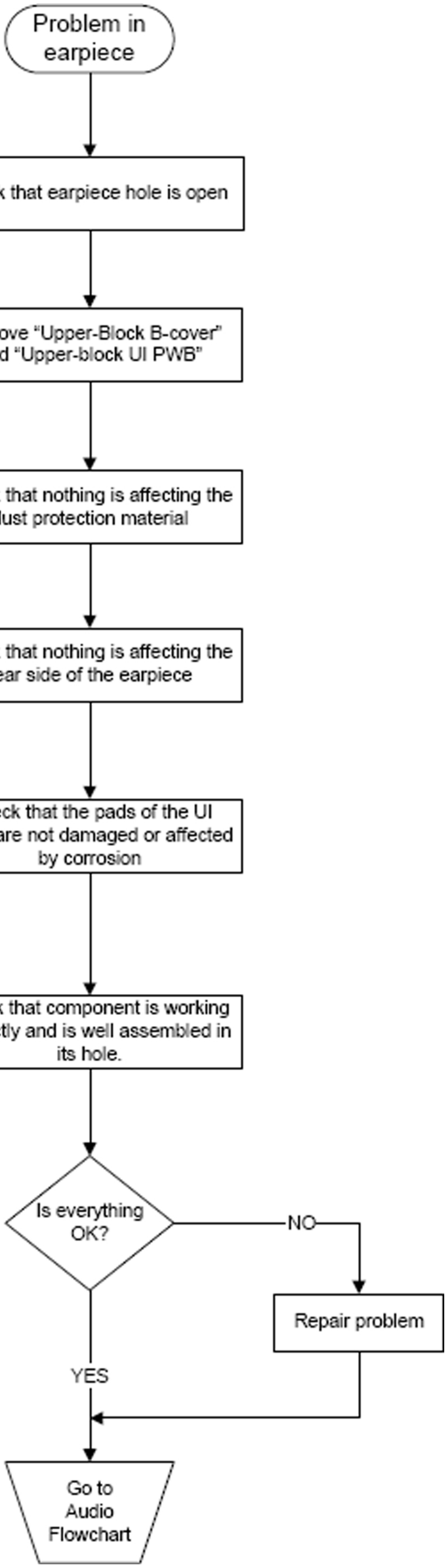
Acoustics design ensures that the sound is detected correctly with a microphone and properly radiated to the outside of the device by speaker(s). The acoustics of the phone includes three basic systems: earpiece, Integrated Hands Free (IHF) and microphone.

The sound reproduced from the earpiece radiates through a single hole on the front cover (A-cover). The sound reproduced from the IHF speakers radiates through a single hole on the Antenna cap (Antenna assy). Microphone is located at the bottom, next to the system connector.

For a correct functionality of the phone, all sound holes must be always open. When the phone is used, care must be taken not to close any of those holes with a hand or fingers. The phone should be dry and clean, and no objects must be located in such a way that they close any of the holes.

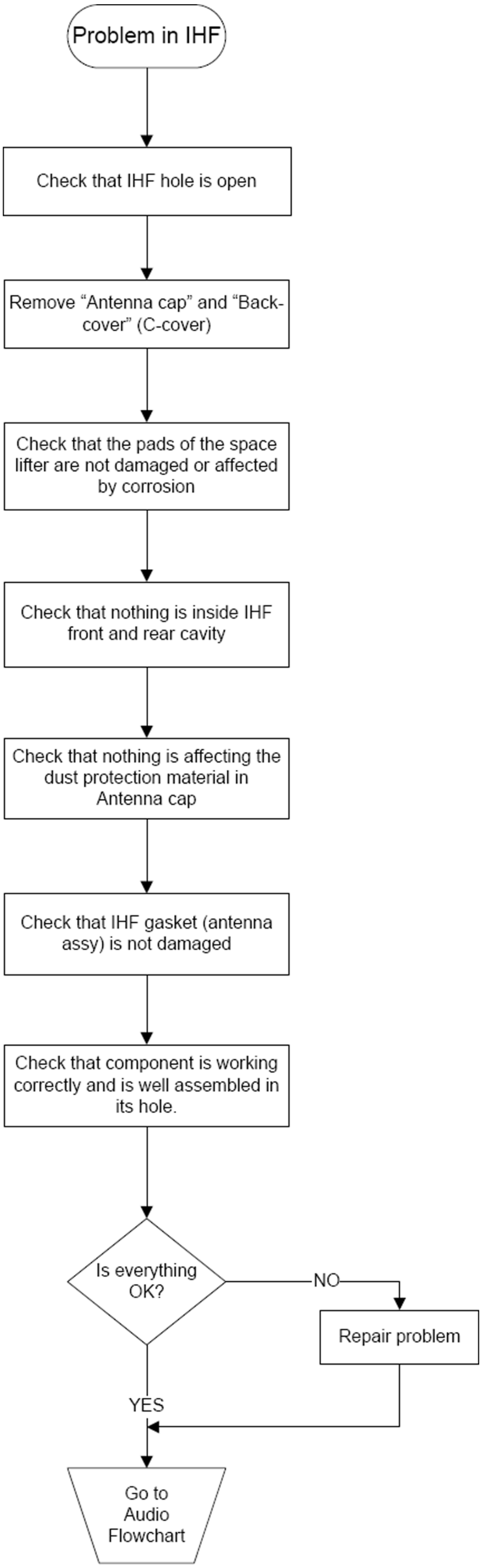
Earpiece troubleshooting

Troubleshooting flow


Problem in earpiece
Check that earpiece hole is open
Remove "Upper-Block B-cover" and "Upper-block UI PWB"
Check that nothing is affecting the dust protection material
Check that nothing is affecting the rear side of the earpiece
Check that the pads of the UI PWB are not damaged or affected by corrosion
Check that component is working correctly and is well assembled in its hole.
Is everything OK?
NO
Repair problem
YES
Go to Audio Flowchart

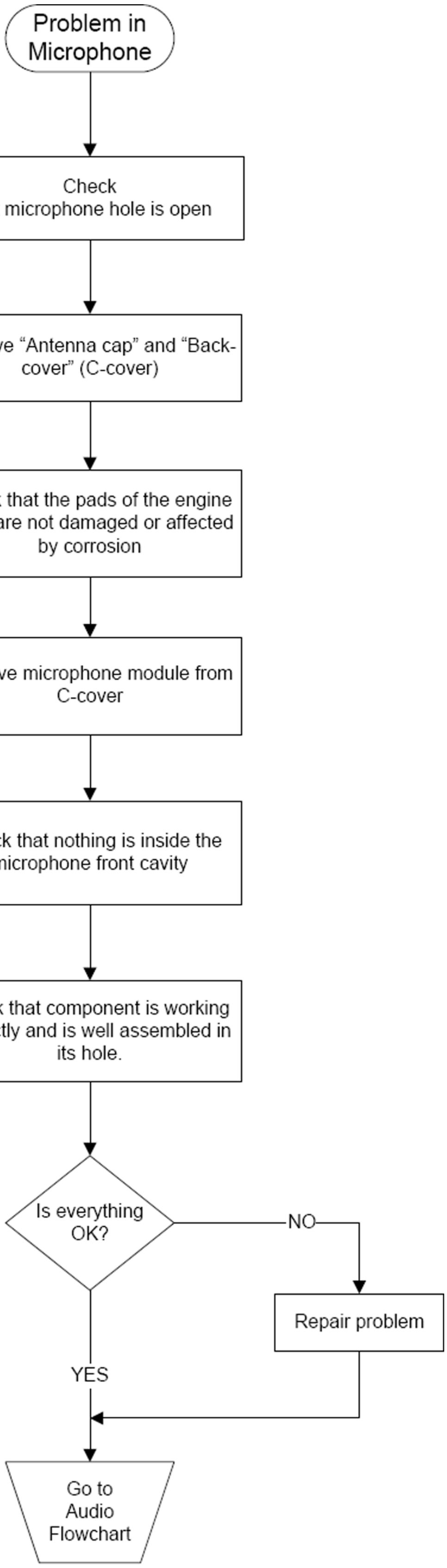
IHF troubleshooting

Troubleshooting flow


Problem in IHF
Check that IHF hole is open
Remove "Antenna cap" and "Back-cover" (C-cover)
Check that the pads of the space lifter are not damaged or affected by corrosion
Check that nothing is inside IHF front and rear cavity
Check that nothing is affecting the dust protection material in Antenna cap
Check that IHF gasket (antenna assy) is not damaged
Check that component is working correctly and is well assembled in its hole.
Is everything OK?
NO
Repair problem
YES
Go to Audio Flowchart

Microphone troubleshooting

Troubleshooting flow


Problem in Microphone
Check that microphone hole is open
Remove “Antenna cap” and “Back-cover” (C-cover)
Check that the pads of the engine PWB are not damaged or affected by corrosion
Remove microphone module from C-cover
Check that nothing is inside the microphone front cavity
Check that component is working correctly and is well assembled in its hole.
Is everything OK?
NO
Repair problem
YES
Go to Audio Flowchart

Baseband manual tuning guide

Energy management calibration

Prerequisites

Energy Management (EM) calibration is performed to calibrate the setting (gain and offset) of AD converters in several channels (that is, **battery voltage**, **BSI**, **battery current**) to get an accurate AD conversion result.

Hardware setup:

- An external power supply is needed.
- Supply 12V DC from an external power supply to CU-4 to power up the phone.
- The phone must be connected to a CU-4 control unit with a product-specific flash adapter.

Steps

1. Place the phone to the docking station adapter (CU-4 is connected to the adapter).
2. Start *Phoenix* service software.
3. Choose **File→ Scan Product.**
4. Choose **Tuning→Energy Management Calibration.**
5. To show the current values in the phone memory, click **Read**, and check that communication between the phone and CU-4 works.
6. Check that the **CU-4 used** check box is checked.
7. Select the item(s) to be calibrated.

   Note: ADC calibration has to be performed before other item(s). However, if all calibrations are selected at the same time, there is no need to perform the ADC calibration first.

8. Click **Calibrate**.

   The calibration of the selected item(s) is carried out automatically.

   The candidates for the new calibration values are shown in the *Calculated values* column. If the new calibration values seem to be acceptable (please refer to the following "Calibration value limits" table), click **Write** to store the new calibration values to the phone permanent memory.

Table 10 Calibration value limits

Parameter	Min.	Max.
ADC Offset	-20	20
ADC Gain	12000	14000
BSI Gain	1100	1300
VBAT Offset	2400	2650
VBAT Gain	19000	23000
IBAT (ICal) Gain	6200	15600

9. Click **Read**, and confirm that the new calibration values are stored in the phone memory correctly. If the values are not stored to the phone memory, click **Write** and/or repeat the procedure again.
10. To end the procedure, close the *Energy Management Calibration* window.

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7 — RF Troubleshooting and Manual Tuning Guide

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Introduction to RF troubleshooting

All measurements should be done using:

- spectrum analyser with a high-frequency high-impedance passive probe (LO-/reference frequencies and RF power levels)
- oscilloscope with a 10:1 probe (DC-voltages and low frequency signals)

> **Caution:** Also all measurements with an RF coupler should be performed in RF shielded environment because nearby base stations can disturb sensitive receiver measurements. If there is no possibility to use RF shielded environment, it should be checked that there are no transmissions on the same frequencies as used in the tests.

The RF section of the phone is build around one RF ASIC: ASIC N7505.

> **Note:** Before changing N7505, please check the following things: supply voltages and serial communication coming from baseband toN7505 are OK. Please note that the grounding of the Frond End Module (FEM) is directly below FEM so it is difficult to check or change.

Most RF semiconductors are static discharge sensitive! ESD protection must be taken care of during repair (ground straps and ESD soldering irons). N7505 and FEM are moisture sensitive, so parts must be pre-baked prior to soldering.

In addition to key components, there are lot of discrete components (resistors, inductors and capacitors) which troubleshooting is done mainly by checking if the soldering of the component is done properly.

Capacitor can be checked for shorts and resistors for value by means of an ohmmeter, but be aware in-circuit measurements should be evaluated carefully as other components connected to the same node can change the seen resistance.

Keep in mind that all measured voltages or RF levels depicted in the service manual are rough figures. Especially RF levels vary because of different measuring equipment or different grounding of the probe used.

When using an RF probe, use a pair of metallic tweezers to connect the probe ground to the PWB ground as close to the measurement point as possible. If measurements are performed in a product specific module jig, then “GND” pads should be used for the probe ground.

RF key component placement

The RF section of the phone is build around one RF ASIC: ASIC N7505.

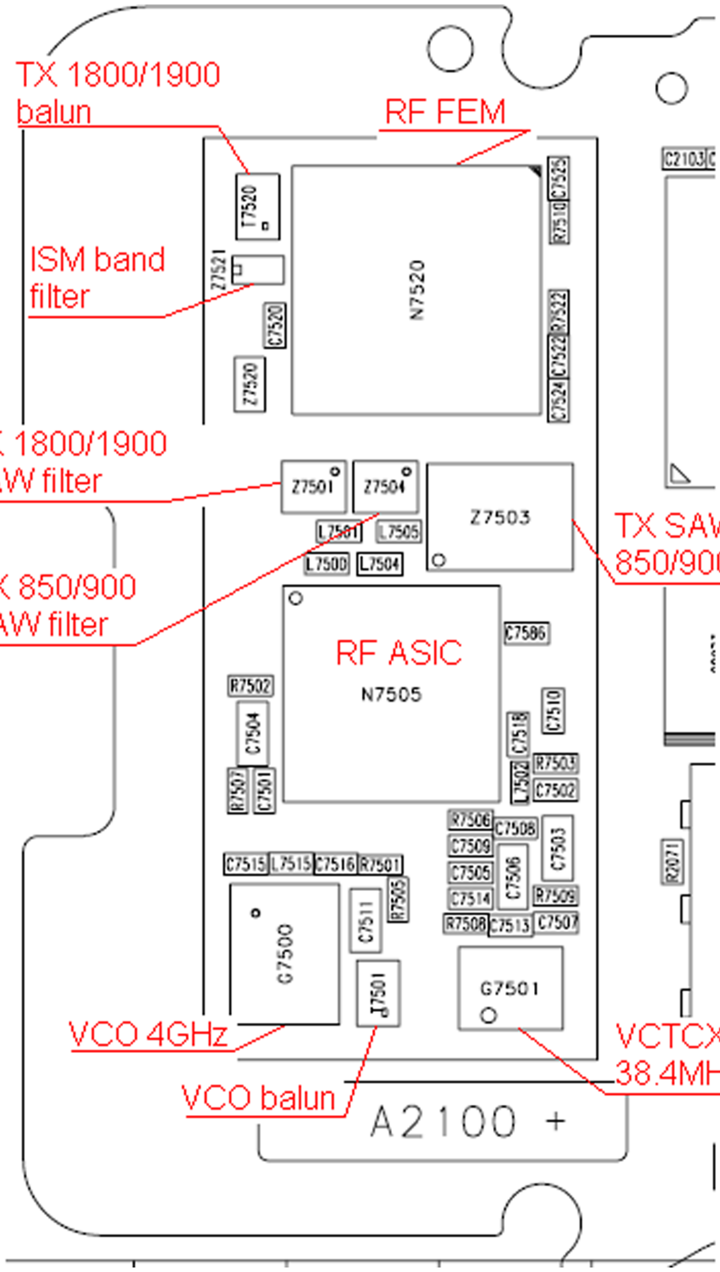

TX 1800/1900 balun
RF FEM
ISM band filter
RX 1800/1900 SAW filter
RX 850/900 SAW filter
TX SAW filter 850/900
RF ASIC
N7505
N7520
T7520
Z7521
Z7520
C7520
Z7501
Z7504
Z7503
G7500
G7501
T7501
VCO 4GHz
VCO balun
VCTCXO 38.4MHz
A2100 +

Figure 47 RM-198 RF key component placement

Receiver troubleshooting

Introduction to RX troubleshooting

Rx can be tested by making a phone call or in the local mode. For the local mode testing, use Phoenix service software.

The main Rx troubleshooting measurement is RSSI measurement. This test measures the signal strength of the received signal. I and Q branches can be measured separately.

In GSM, the input signal can be either a real GSM signal or a CW signal that is 67.771kHz up from the carrier frequency.

For service tool usage instructions, refer to section Service Tools and Service Concepts.

General instructions for RX troubleshooting

Steps

1. Connect a test jig to a computer with a DKU-2 cable or to a FPS-10 flash prommer with a modular cable (XCS-4).

   Make sure that you have a PKD-1 dongle connected to the computer's parallel port.

2. Connect a DC power supply to a module test jig (MJ-111).

   Note: Set the DC supply voltage to 12 V and set the jumper connector on the test jig's **reg.pass** switch to “ON” position.

3. Connect an RF cable between the RF connector of the phone and measurement equipment or alternatively use a 50 ohms (at least 2W) dummy, otherwise GSM may be damaged.

   Note: Make sure that all connections are made to the correct RF connector and correct type of RF probe is used.

4. Set Rx on.

   i Set the phone module to the test jig and start *Phoenix service software*.

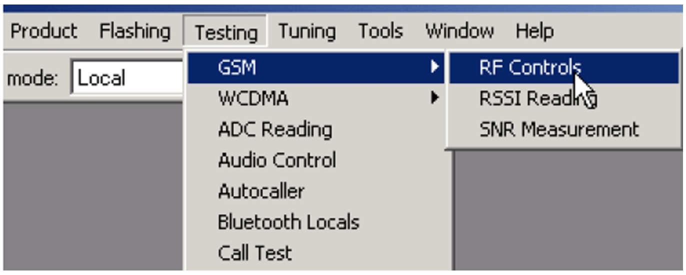
   ii Initialize connection to the phone. (With FPS-10 use FBUS driver when using DKU-2 and COMBOX driver).

   iii From the File menu, choose product: **File -> Choose Product -> xx-x*** (* = type designator of the phone, scan product).

   iv From the toolbar, set operating mode to “Local”.

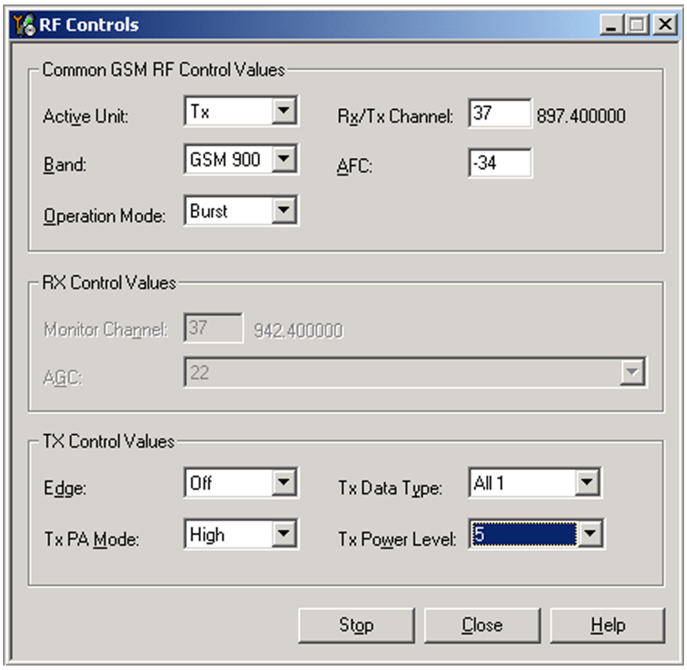
5. EGSM900, GSM850/1800/1900 troubleshooting

   i From the Testing menu, activate the *RF Controls* window: **Testing -> GSM -> RF Controls** .



   ii In the *RF Controls* window:

   - Select band "GSM850", “GSM900” or “GSM1800” or “GSM1900” (Default = “GSM850”).
   - Set Active unit to “Rx” (Default = “Rx”).
   - Set Operation mode to “Burst” (Default = “Burst”).
   - Set Rx/Tx channel to 190 on GSM850, 37 on GSM900 band or 700 on GSM1800 band or 661 on GSM1900 (Defaults).
   - Set Edge to “Off” (Default). (Not active in RXmode).
   - Set Tx PA mode to “Free” (Default). (Not active in RXmode).
   - Apply 942.46771 MHz (channel 37 + 67.710 kHz offset), 881.66771MHz (channel 190 + 67.710 kHz), 1842.86771 MHz (channel 700 + 67.710 kHz offset) or 1960.06771 MHz (channel 661 + 67.71 kHz) –90 dBm signal to the RF-connector (remember to compensate for cable attenuation).



Common GSM RF Control Values

Active Unit: Tx
Band: GSM 900
Operation Mode: Burst
Rx/Tx Channel: 37 897.400000
AFC: -34

RX Control Values

Monitor Channel: 37 942.400000
AGC: 22

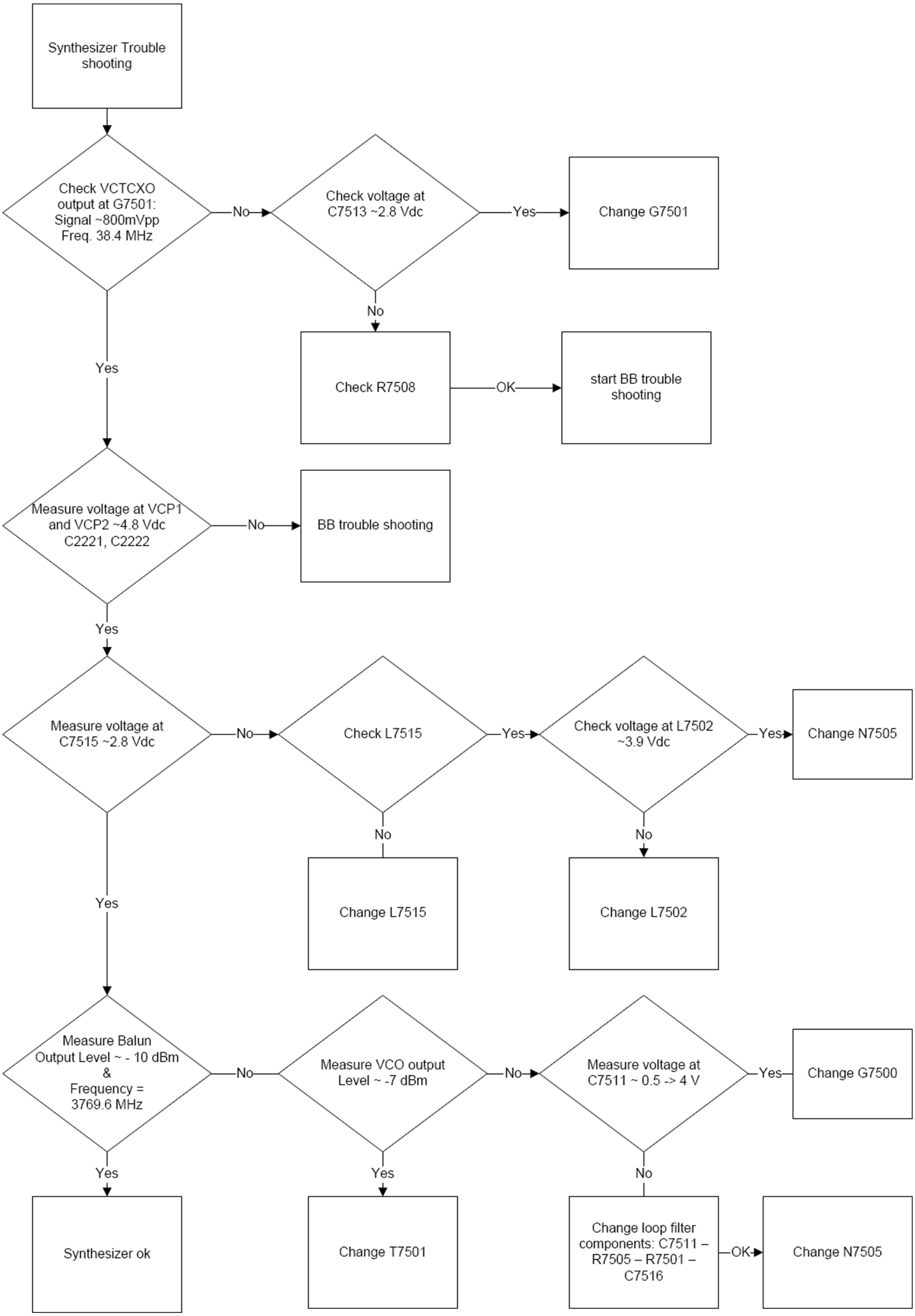
TX Control Values

Edge: Off
Tx PA Mode: High
Tx Data Type: All 1
Tx Power Level: 5

Figure 48 RF Controls window

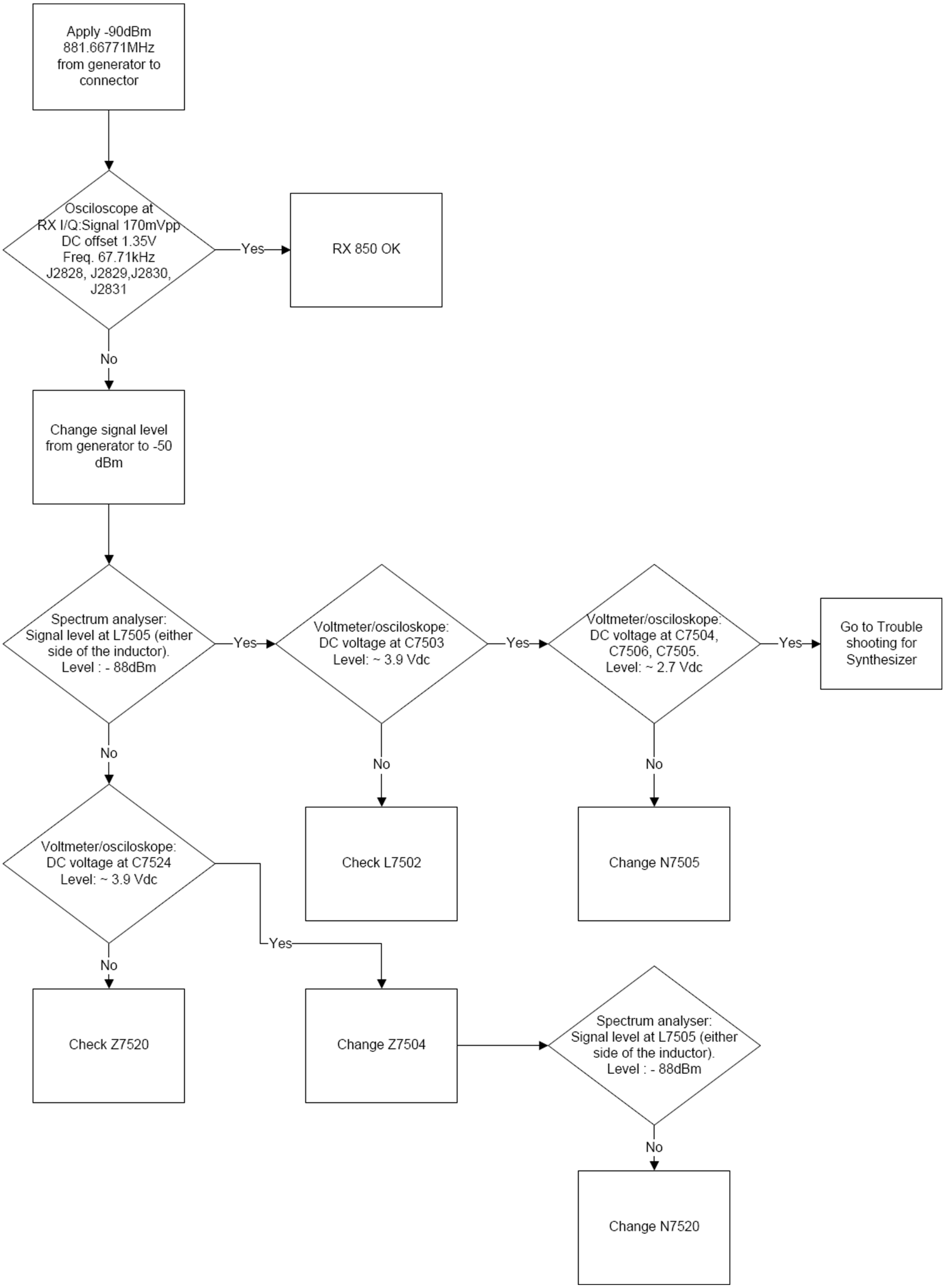
Synthesizer troubleshooting

Troubleshooting flow


Synthesizer Trouble shooting
Check VCTCXO output at G7501: Signal ~800mVpp Freq. 38.4 MHz
No
Check voltage at C7513 ~2.8 Vdc
Yes
Change G7501
No
Check R7508
OK
start BB trouble shooting
Yes
Measure voltage at VCP1 and VCP2 ~4.8 Vdc C2221, C2222
No
BB trouble shooting
Yes
Measure voltage at C7515 ~2.8 Vdc
No
Check L7515
Yes
Check voltage at L7502 ~3.9 Vdc
Yes
Change N7505
No
Change L7515
No
Change L7502
Yes
Measure Balun Output Level ~ - 10 dBm & Frequency = 3769.6 MHz
No
Measure VCO output Level ~ -7 dBm
No
Measure voltage at C7511 ~ 0.5 -> 4 V
Yes
Change G7500
Yes
Synthesizer ok
Yes
Change T7501
No
Change loop filter components: C7511 – R7505 – R7501 – C7516
OK
Change N7505

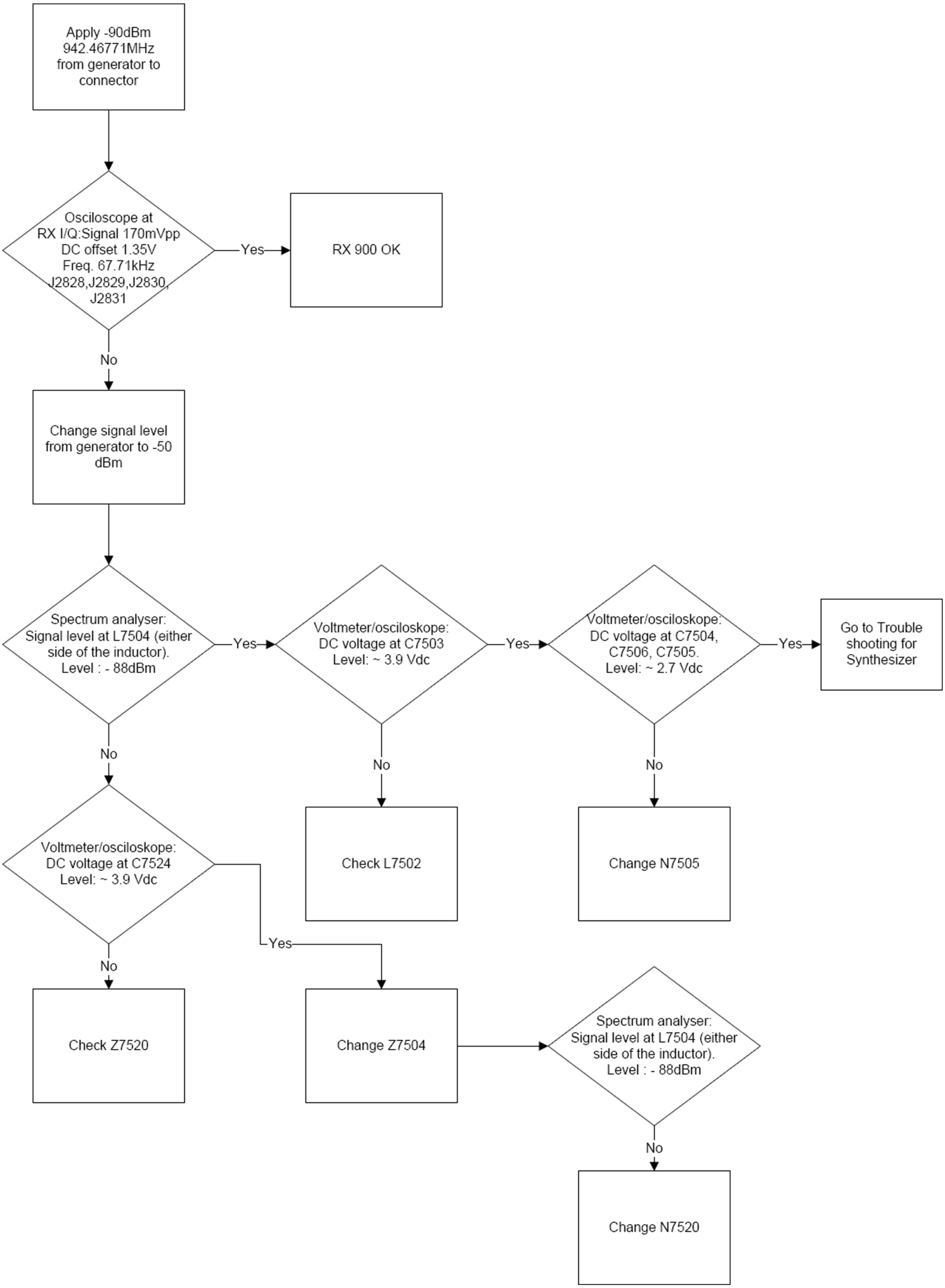
RX GSM850 troubleshooting

Troubleshooting flow


Apply -90dBm 881.66771MHz from generator to connector
Osciloscope at RX I/Q:Signal 170mVpp DC offset 1.35V Freq. 67.71kHz J2828, J2829,J2830, J2831
Yes
RX 850 OK
No
Change signal level from generator to -50 dBm
Spectrum analyser: Signal level at L7505 (either side of the inductor). Level : - 88dBm
Yes
Voltmeter/osciloskope: DC voltage at C7503 Level: ~ 3.9 Vdc
Yes
Voltmeter/osciloskope: DC voltage at C7504, C7506, C7505. Level: ~ 2.7 Vdc
Yes
Go to Trouble shooting for Synthesizer
No
No
No
Voltmeter/osciloskope: DC voltage at C7524 Level: ~ 3.9 Vdc
Check L7502
Change N7505
Yes
No
Check Z7520
Change Z7504
Spectrum analyser: Signal level at L7505 (either side of the inductor). Level : - 88dBm
No
Change N7520

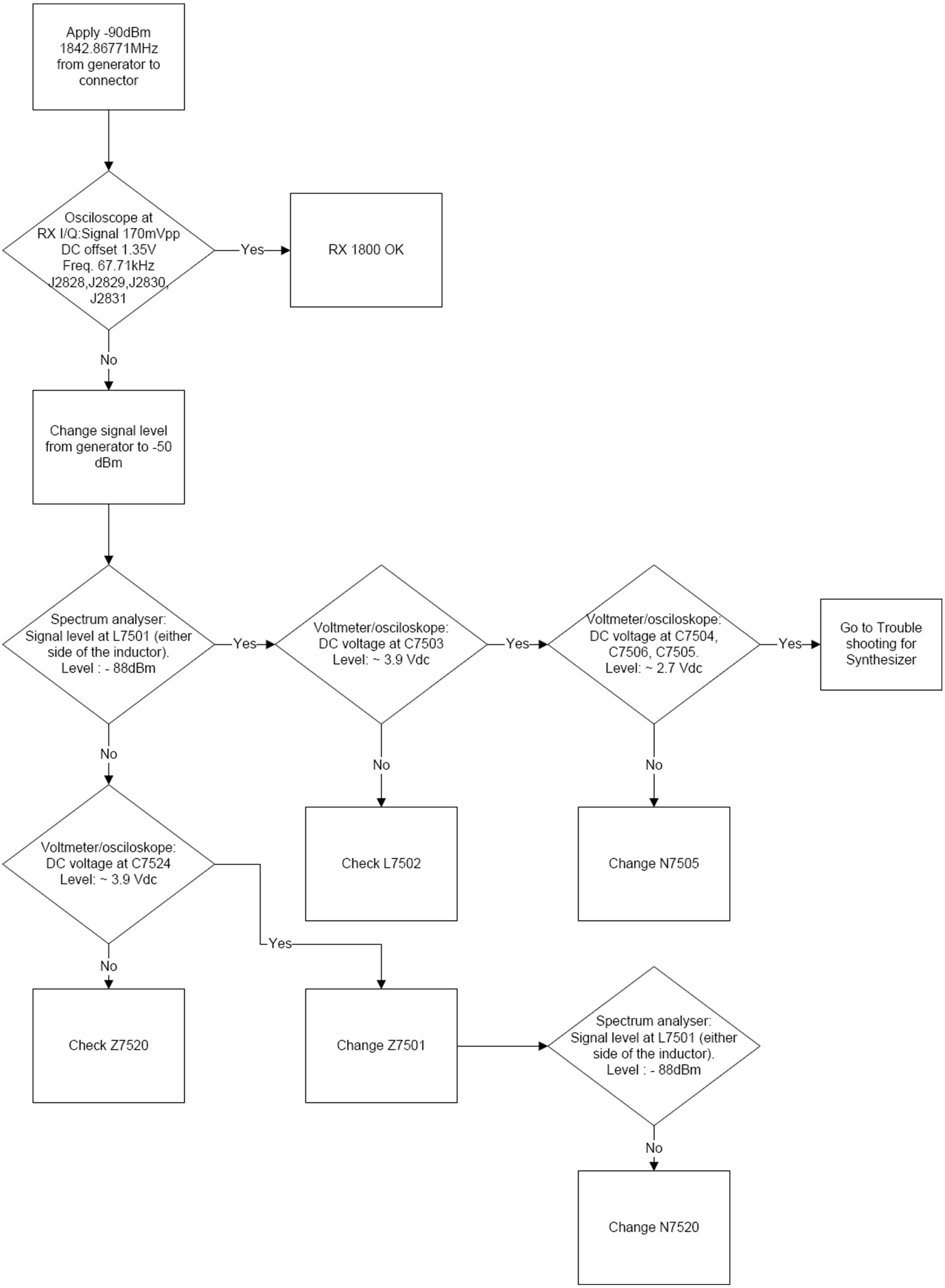
RX GSM900 troubleshooting

Troubleshooting flow


Apply -90dBm 942.46771MHz from generator to connector
Osciloscope at RX I/Q:Signal 170mVpp DC offset 1.35V Freq. 67.71kHz J2828,J2829,J2830, J2831
Yes
RX 900 OK
No
Change signal level from generator to -50 dBm
Spectrum analyser: Signal level at L7504 (either side of the inductor). Level : - 88dBm
Yes
Voltmeter/osciloskope: DC voltage at C7503 Level: ~ 3.9 Vdc
Yes
Voltmeter/osciloskope: DC voltage at C7504, C7506, C7505. Level: ~ 2.7 Vdc
Yes
Go to Trouble shooting for Synthesizer
No
No
No
Voltmeter/osciloskope: DC voltage at C7524 Level: ~ 3.9 Vdc
Check L7502
Change N7505
Yes
No
Check Z7520
Change Z7504
Spectrum analyser: Signal level at L7504 (either side of the inductor). Level : - 88dBm
No
Change N7520

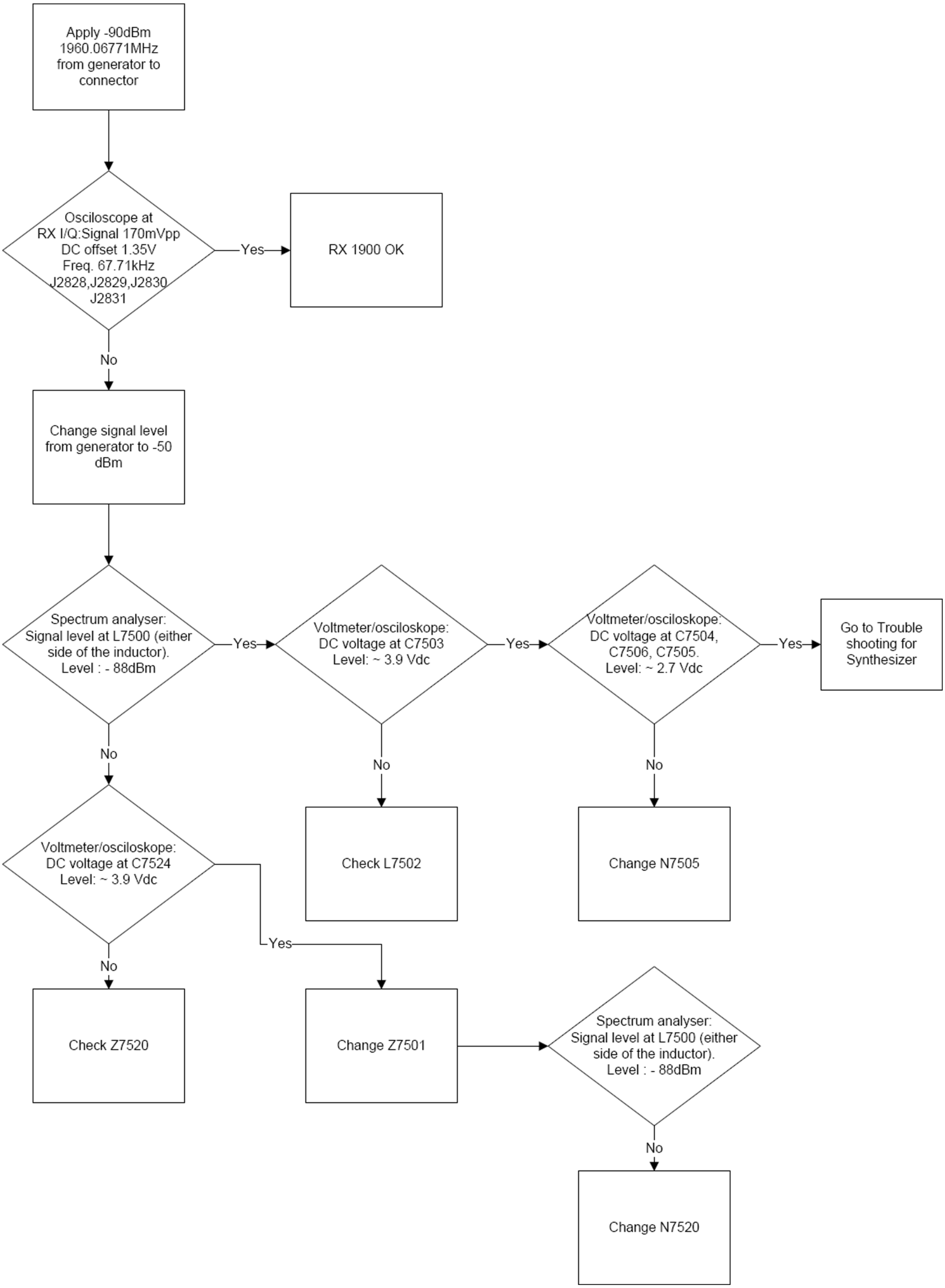
RX GSM1800 troubleshooting

Troubleshooting flow


Apply -90dBm 1842.86771MHz from generator to connector
Osciloscope at RX I/Q:Signal 170mVpp DC offset 1.35V Freq. 67.71kHz J2828,J2829,J2830, J2831
Yes
RX 1800 OK
No
Change signal level from generator to -50 dBm
Spectrum analyser: Signal level at L7501 (either side of the inductor). Level : - 88dBm
Yes
Voltmeter/osciloskope: DC voltage at C7503 Level: ~ 3.9 Vdc
Yes
Voltmeter/osciloskope: DC voltage at C7504, C7506, C7505. Level: ~ 2.7 Vdc
Yes
Go to Trouble shooting for Synthesizer
No
No
No
Voltmeter/osciloskope: DC voltage at C7524 Level: ~ 3.9 Vdc
Check L7502
Change N7505
Yes
No
Check Z7520
Change Z7501
Spectrum analyser: Signal level at L7501 (either side of the inductor). Level : - 88dBm
No
Change N7520

RX GSM1900 troubleshooting

Troubleshooting flow


Apply -90dBm 1960.06771MHz from generator to connector
Osciloscope at RX I/Q:Signal 170mVpp DC offset 1.35V Freq. 67.71kHz J2828,J2829,J2830 J2831
Yes
RX 1900 OK
No
Change signal level from generator to -50 dBm
Spectrum analyser: Signal level at L7500 (either side of the inductor). Level : - 88dBm
Yes
Voltmeter/osciloskope: DC voltage at C7503 Level: ~ 3.9 Vdc
Yes
Voltmeter/osciloskope: DC voltage at C7504, C7506, C7505. Level: ~ 2.7 Vdc
Yes
Go to Trouble shooting for Synthesizer
No
No
No
Voltmeter/osciloskope: DC voltage at C7524 Level: ~ 3.9 Vdc
Check L7502
Change N7505
Yes
No
Check Z7520
Change Z7501
Spectrum analyser: Signal level at L7500 (either side of the inductor). Level : - 88dBm
No
Change N7520

GSM Rx chain activation for manual measurements / GSM RSSI measurement

Context

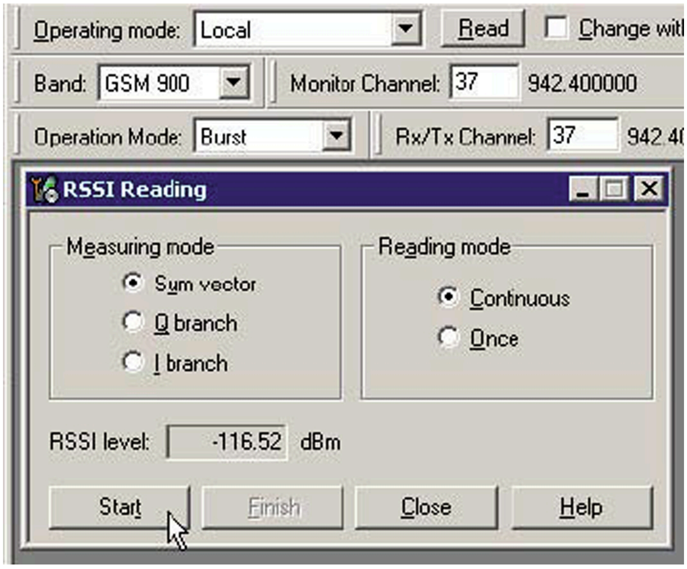
RSSI signal measurement is the main Rx troubleshooting measurement. The test measures the strength of the received signal.

I and Q branches can be measured separately. In GSM, the input signal can be either a real GSM signal or a CW (Continuous Wave) signal that is 67.771 kHz above the carrier frequency.

Steps

1. Start *Phoenix* service software.
2. Choose **Testing→GSM→RSSI Reading** .
3. Set the RF signal generator for a channel frequency +67.771 kHz in CW mode with a –80 dBm signal level.

   Alternatively set the cellular tester downlink channel to the appropriate channel. Make sure that the tester is set to continuous mode, not to burst mode.
4. In the *RSSI Reading* window, select the appropriate band and channel.



Operating mode: Local

Band: GSM 900

Monitor Channel: 37 942.400000

Operation Mode: Burst

Rx/Tx Channel: 37 942.4

RSSI Reading

Measuring mode: ● Sum vector ○ Q branch ○ I branch

Reading mode: ● Continuous ○ Once

RSSI level: -116.52 dBm

Figure 49 *RSSI Reading* window

5. To start the measurement, activate GSM Rx chain, click **Start**.

Results

RSSI reading values of the selected band and channel are displayed. The RSSI level must be the same value as that which is set at the signal generator (-80 dBm).

Transmitter troubleshooting

General instructions for TX troubleshooting

Context

- Tx troubleshooting requires Tx operation.
- Do not transmit on frequencies that are in use!
- Transmitter can be controlled in the local mode for diagnostic purposes.
- The most useful Phoenix tool for GSM transmitter testing is "RF Controls".

- Tx IQ tuning and Tx power tuning can be also used in some cases.
- Remember that retuning is not a fix! Phones are tuned correctly in production.

The first set of steps instructs how to assemble the test setup. This setup is general for all Tx troubleshooting tasks.

Alternative steps provide specific troubleshooting instructions for *Phoenix* service software.

> **Caution:** Never activate the GSM transmitter without a proper antenna load. There should be always 50 ohm load connected to the RF connector (antenna, RF-measurement equipment or at least 2 watts dummy load), otherwise GSM PA may be damaged.

Steps

1. Connect a test jig to a computer with a DKU-2 cable or to a FPS-10 flash prommer with a modular cable (XCS-4).

   Make sure that you have a PKD-1 dongle connected to the computer's parallel port.

2. Connect a DC power supply to a module jig (MJ-111).

   > **Note:** When repairing or tuning a transmitter, use an external DC supply with at least 3 A current capability.
   >
   > Set the DC supply voltage to 12V and set the jumper connector on the test jig's **reg.pass** switch to “ON” position.

3. Connect an RF cable between the RF connector of the phone and measurement equipment or alternatively use a 50 ohms (at least 2 W) dummy, otherwise GSM may be damaged.

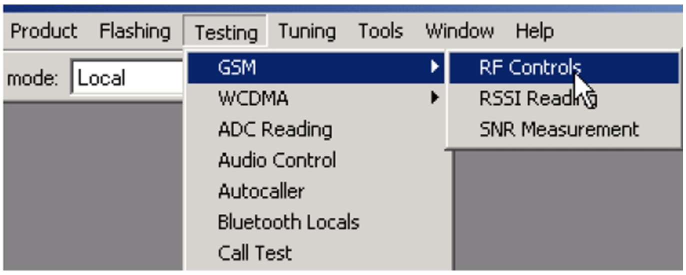
   > **Note:** Make sure that all connections are made to the correct RF connector and correct type of RF probe is used.

   Normally a spectrum analyser is used as measurement equipment.

   > **Note:** The maximum input power of a spectrum analyser is +30 dBm.
   >
   > To prevent any damage, it is recommended to use 10 dB attenuator on the spectrum analyzer input.

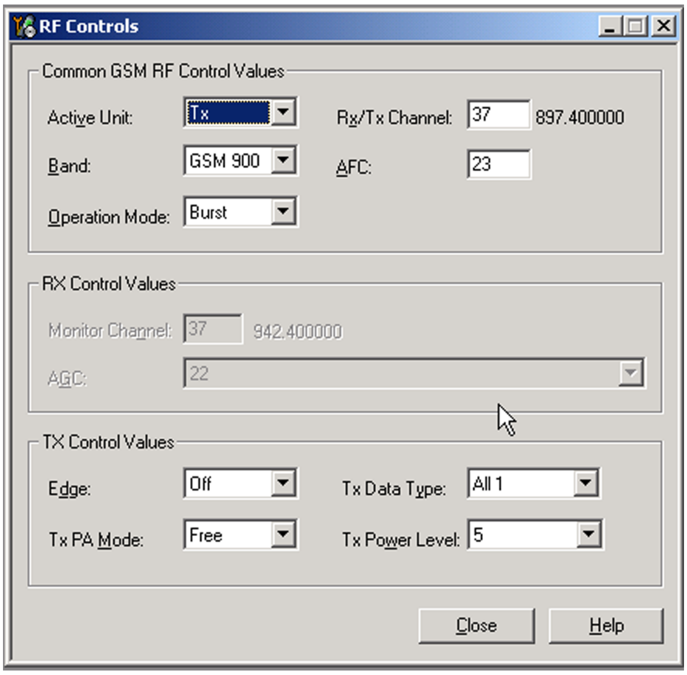
4. Set Tx on.
   - i Set the phone module to the test jig and start *Phoenix service software*.
   - ii Initialize connection to the phone. (With FPS-10 use FBUS driver when using DAU-9S and COMBOX driver).
   - iii From the File menu, choose product: **File -> Choose Product -> xx-x*** (* = type designator of the phone).
   - iv From the toolbar, set operating mode to “Local”.

5. EGSM900, GSM850/1800/1900 troubleshooting
   - i From the Testing menu, activate the *RF Controls* window: **Testing -> GSM -> RF Controls** .



   - ii In the *RF Controls* window:
     - Select band "GSM850", “GSM900” or “GSM1800” or “GSM1900” (Default = “GSM850”).

- Set Active unit to “Tx” (Default = “Rx”).
- Set Operation mode to “Burst” (Default = “Burst”).
- Set Tx data type to “Random” (Default = “All1”).
- Set Rx/Tx channel to 190 on GSM850, 37 on GSM900 band or 700 on GSM1800 band or 661 on GSM1900 (Defaults).
- Set Edge to “Off” (Default).
- Set Tx PA mode to “Free” (Default).
- Set power level to 5 (Default = 19) on GSM850/900 or to 0 (Default = 15) on GSM1800 or GSM1900.



RF Controls

Common GSM RF Control Values

Active Unit: Tx

Rx/Tx Channel: 37 897.400000

Band: GSM 900

AFC: 23

Operation Mode: Burst

RX Control Values

Monitor Channel: 37 942.400000

AGC: 22

TX Control Values

Edge: Off

Tx Data Type: All 1

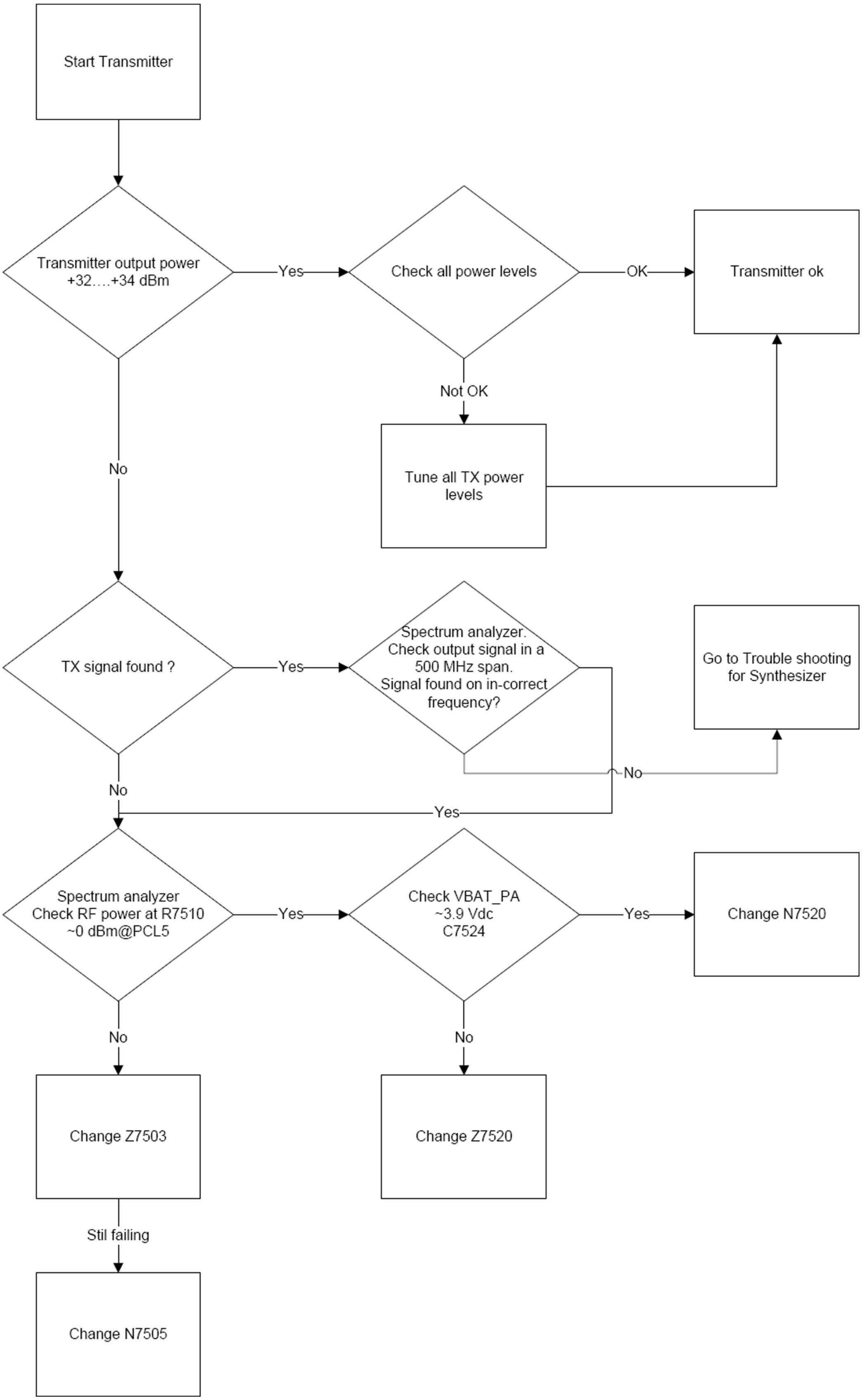
Tx PA Mode: Free

Tx Power Level: 5

Figure 50 RF Controls window

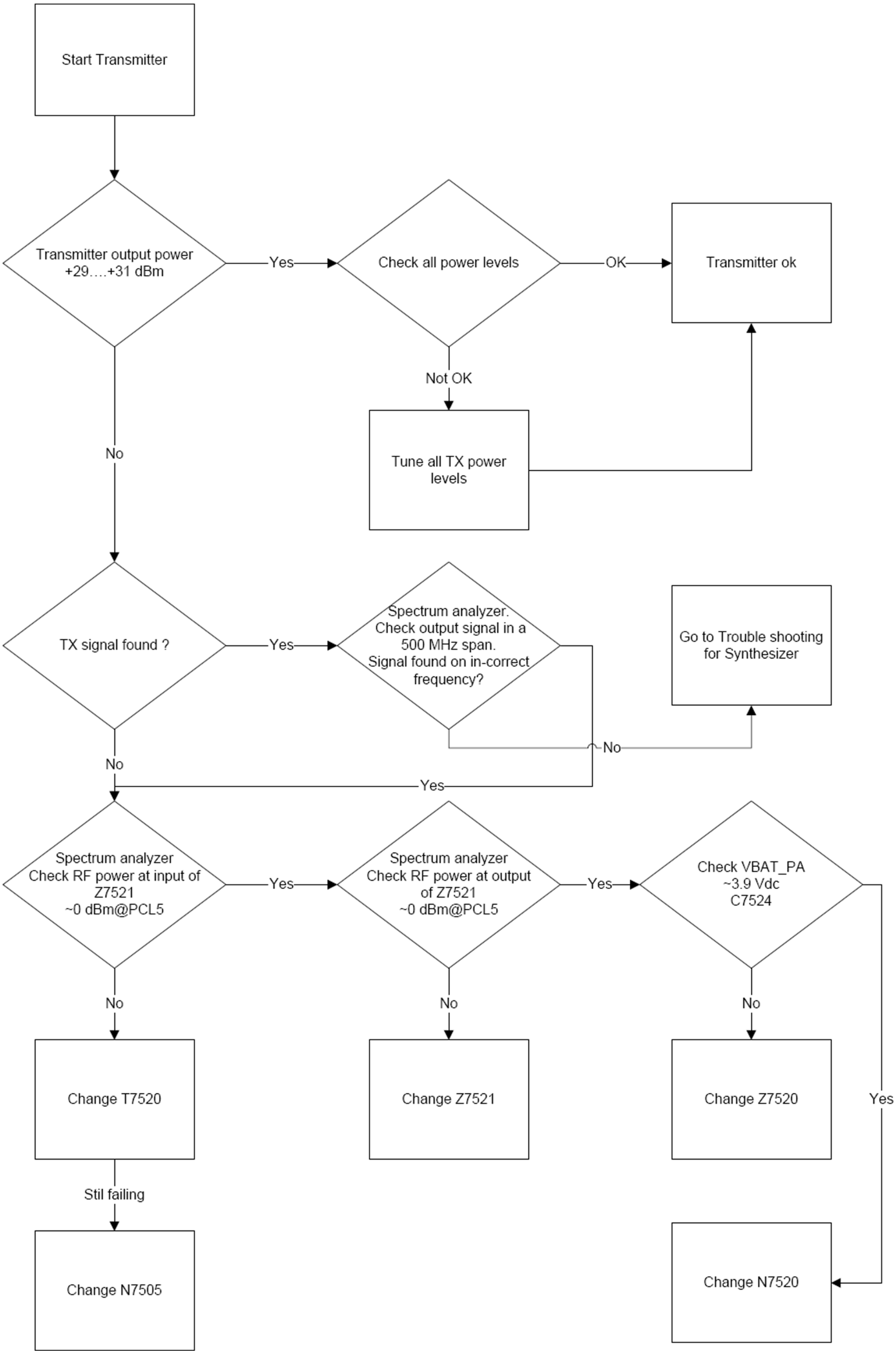
TX 850/900 troubleshooting

Troubleshooting flow


Start Transmitter
Transmitter output power +32….+34 dBm
Yes
Check all power levels
OK
Transmitter ok
Not OK
Tune all TX power levels
No
TX signal found ?
Yes
Spectrum analyzer. Check output signal in a 500 MHz span. Signal found on in-correct frequency?
Go to Trouble shooting for Synthesizer
No
No
Yes
Spectrum analyzer Check RF power at R7510 ~0 dBm@PCL5
Yes
Check VBAT_PA ~3.9 Vdc C7524
Yes
Change N7520
No
No
Change Z7503
Change Z7520
Stil failing
Change N7505

TX 1800/1900 troubleshooting

Troubleshooting flow


Start Transmitter
Transmitter output power +29….+31 dBm
Yes
Check all power levels
OK
Transmitter ok
Not OK
Tune all TX power levels
No
TX signal found ?
Yes
Spectrum analyzer. Check output signal in a 500 MHz span. Signal found on in-correct frequency?
Go to Trouble shooting for Synthesizer
No
No
Yes
Spectrum analyzer Check RF power at input of Z7521 ~0 dBm@PCL5
Yes
Spectrum analyzer Check RF power at output of Z7521 ~0 dBm@PCL5
Yes
Check VBAT_PA ~3.9 Vdc C7524
No
No
No
Change T7520
Change Z7521
Change Z7520
Yes
Stil failing
Change N7505
Change N7520

Checking antenna functionality

Main antenna

The main antenna has one antenna: GSM.

In the GSM antenna, there is one feed and one GND contact.

The antenna is functioning normally when it is visually intact and the antenna pins are intact.

BT antenna

BT antenna is a ceramic SMD antenna. The antenna is functioning normally when the contacts function (RDC = 0 ohm) and the antenna is visually intact.

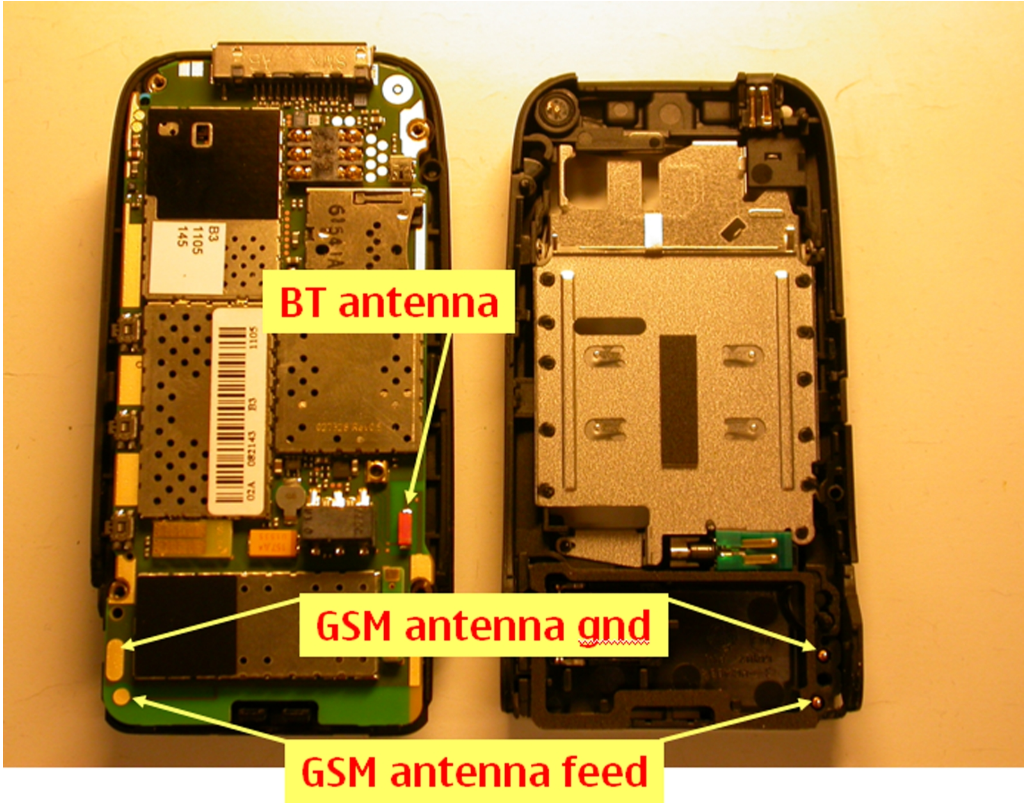


Figure 51 BT antenna, feed and GND spots of the main antenna

RF tunings

Introduction to RF tunings

Important: Only perform RF tunings if:

- one or more of the RF components is changed
- flash Memory chip is changed or otherwise corrupted.

RF calibration is always performed with the help of a product-specific module jig, never with an RF coupler. Using an RF coupler in the calibration phase will cause a complete mistuning of the RF side.

Important: After RF component changes, **always** use autotuning. Manual tunings are only required in rare cases.

Cable and adapter losses

RF cables and adapters have some losses. They have to be taken in account when the phone is tuned. As all the RF losses are frequency dependent, the user have to be very careful and understand the measurement setup. In the following table there are RF attenuations of the module jig:

Band	Attenuation
GSM850	0.2 dB
GSM900	0.2 dB
GSM1800	0.3 dB
GSM1900	0.3 dB

RF autotuning

Prerequisites

For information on the recommended test set-up, refer to the corresponding information on PWS/NOL.

Before you can use the auto-tune feature, the GPIB driver from the GPIB card vendor must be installed and running.

The autotune **.ini** file must be in a correct place: **C:\Program Files\Nokia\Phoenix\products\xx-x*\autotune_xx-x*.ini** (**= indicates the type designator of the phone, e.g. RM-1*)

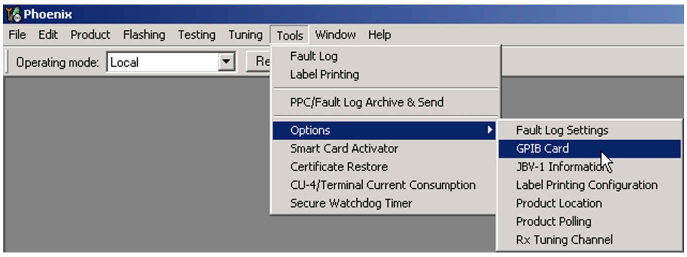
Context

RF autotuning is performed with the aid of Digital Radio Communication Tester. Autotuning covers all RF tunings that are needed to perform after RF component repairs.

> **Note:** Do not perform RF autotuning without a proper reason. Phones are tuned in production and an RF tuning may be performed only after component repairs or if the RF tuning information is lost.

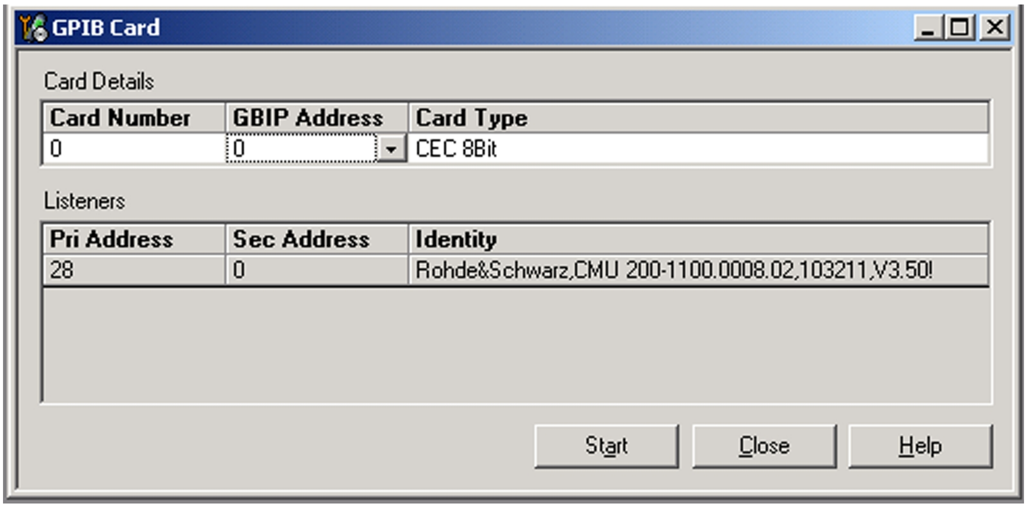
Steps

1. Connect the communication tester to the GPIB bus.
2. Start Phoenix service software.
3. From the Tools menu, choose Options -> GPIB Card.


Phoenix
File
Edit
Product
Flashing
Testing
Tuning
Tools
Window
Help
Operating mode:
Local
Re
Fault Log
Label Printing
PPC/Fault Log Archive & Send
Options
Smart Card Activator
Certificate Restore
CU-4/Terminal Current Consumption
Secure Watchdog Timer
Fault Log Settings
GPIB Card
JBV-1 Information
Label Printing Configuration
Product Location
Product Polling
Rx Tuning Channel

4. In the Card Type line, select CEC8Bit, then click Start.

   After clicking Start, the name of the communication tester appears in the list of found Listeners.


GPIB Card
Start
Close
Help

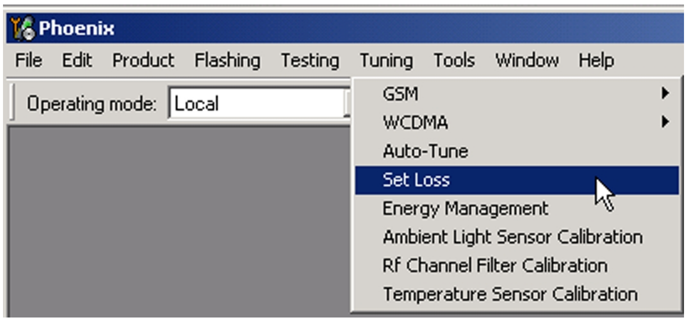
Card Details

Card Number	GBIP Address	Card Type
0	0	CEC 8Bit

Listeners

Pri Address	Sec Address	Identity
28	0	Rohde&Schwarz,CMU 200-1100.0008.02,103211,V3.50!

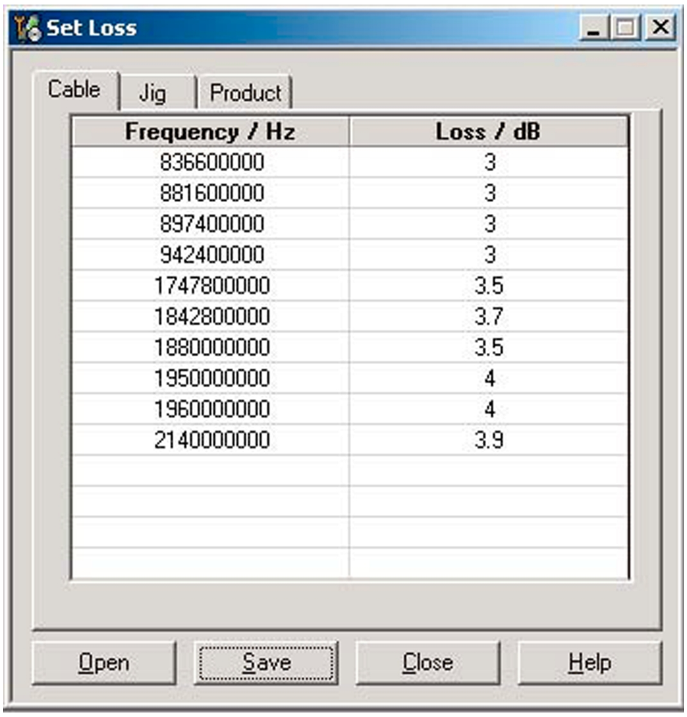
5. To specify the cable loss from module jig to the communication tester, choose "Set Loss" from the Tuning menu.


Phoenix
File
Edit
Product
Flashing
Testing
Tuning
Tools
Window
Help
GSM
WCDMA
Auto-Tune
Set Loss
Energy Management
Ambient Light Sensor Calibration
RF Channel Filter Calibration
Temperature Sensor Calibration

Operating mode: Local

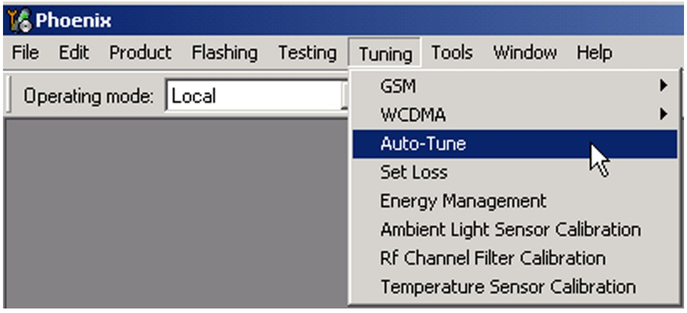
6. Click the Cable tab and add the extra cable attenuation.

Note: Cable losses have to be determined on the basis of a cable used.

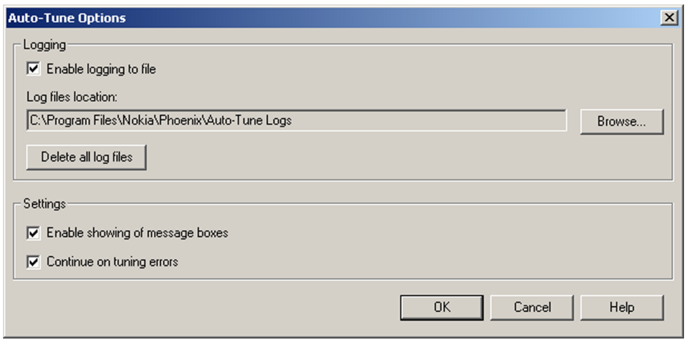

Set Loss
Cable
Jig
Product
Open
Save
Close
Help

Frequency / Hz	Loss / dB
836600000	3
881600000	3
897400000	3
942400000	3
1747800000	3.5
1842800000	3.7
1880000000	3.5
1950000000	4
1960000000	4
2140000000	3.9

7. To start autotuning, choose Auto-Tune from the Tuning menu.


Phoenix
File
Edit
Product
Flashing
Testing
Tuning
Tools
Window
Help
Operating mode:
Local
GSM
WCDMA
Auto-Tune
Set Loss
Energy Management
Ambient Light Sensor Calibration
Rf Channel Filter Calibration
Temperature Sensor Calibration

8. In the Auto-Tune window, click Options.
9. In the Auto-Tune options window, see that the "Enable showing of messages" check box is checked, then click OK.


Auto-Tune Options
Logging
Browse...
Delete all log files
Settings
OK
Cancel
Help

☑ Enable logging to file

Log files location: C:\Program Files\Nokia\Phoenix\Auto-Tune Logs

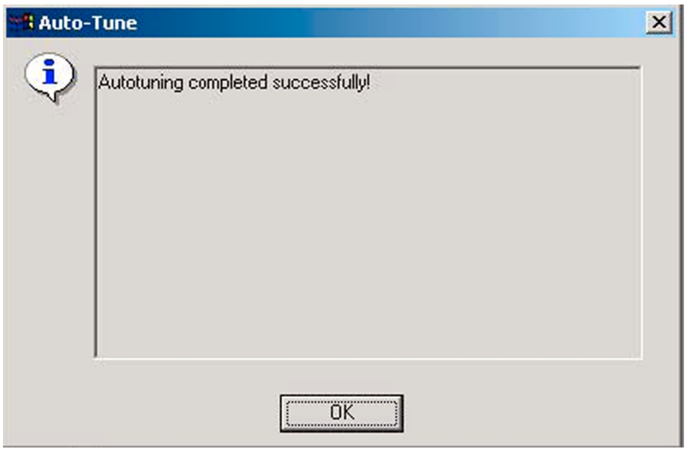
☑ Enable showing of message boxes

☑ Continue on tuning errors

10. To complete the RF autotuning, click OK.

Results

"Autotuning completed successfully" message appears.


Auto-Tune
OK

Autotuning completed successfully!

System mode independent manual tunings

Rf channel filter calibration

Context

Rf channel filter calibration tunes the internal low pass filters of Rx and Tx ASICs that limit the bandwidth of BB IQ signals.

One common calibration is made for GSM.

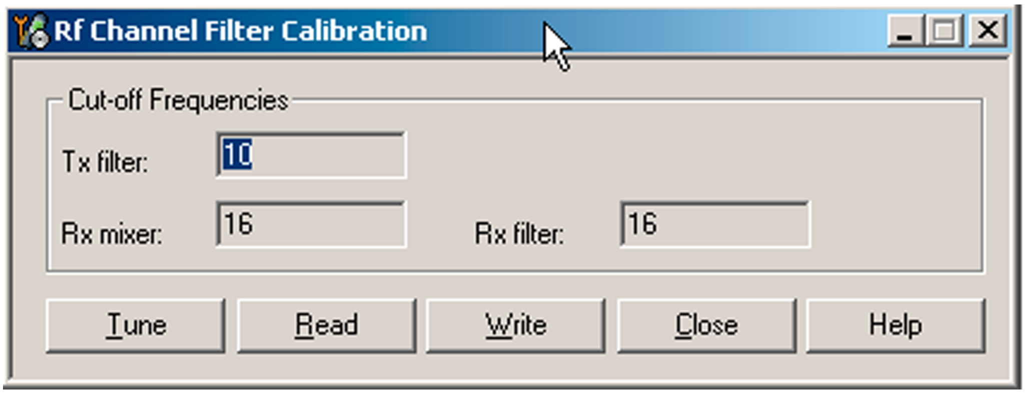
Table 11 Rf channel filter calibration tuning limits

	Min	Typ	Max
Tx filter	0	10	31
Rx filter	0	16	31

Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.
2. Choose **Tuning→Rf Channel Filter Calibration** .
3. Click **Tune**.
4. To save the values to the PMM (Phone Permanent Memory) area, click **Write**.
5. To close the *Rf Channel Filter Calibration* window, click **Close**.

Results



Tx filter: 10
Rx mixer: 16
Rx filter: 16

Figure 52 Rf channel filter calibration typical values

PA (power amplifier) detection

Context

The PA detection procedure detects which PA manufacturer is used for phone PAs.

If a PA is changed or if the permanent memory (PMM) data is corrupted, PA detection has to be performed before Tx tunings.

Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.
2. Choose **Tuning→PA Detection** .
3. Click **Tune**.
4. Check that the detected PA manufacturers are corresponding to the actual chips on the board.
5. To end the procedure, click **Close**.

GSM receiver tunings

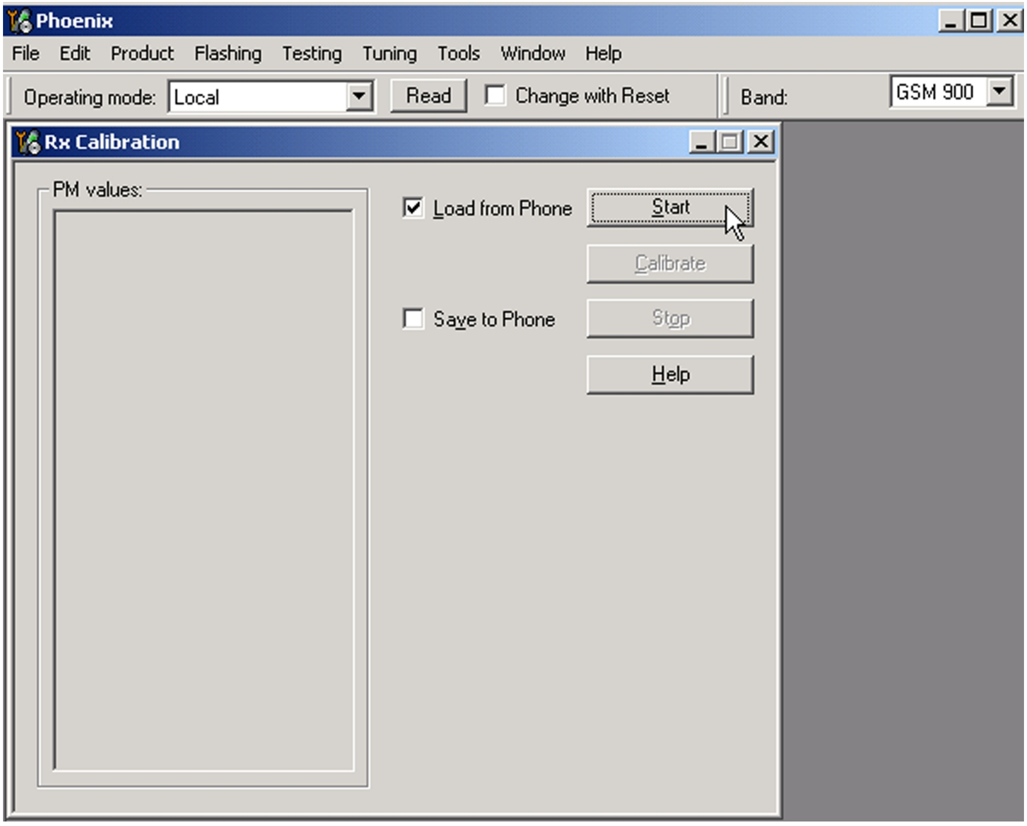
Rx calibration (GSM)

Context

Rx Calibration is used to find out the real gain values of the GSM Rx AGC system and tuning response of the AFC system (AFC D/A init value and AFC slope)

Steps

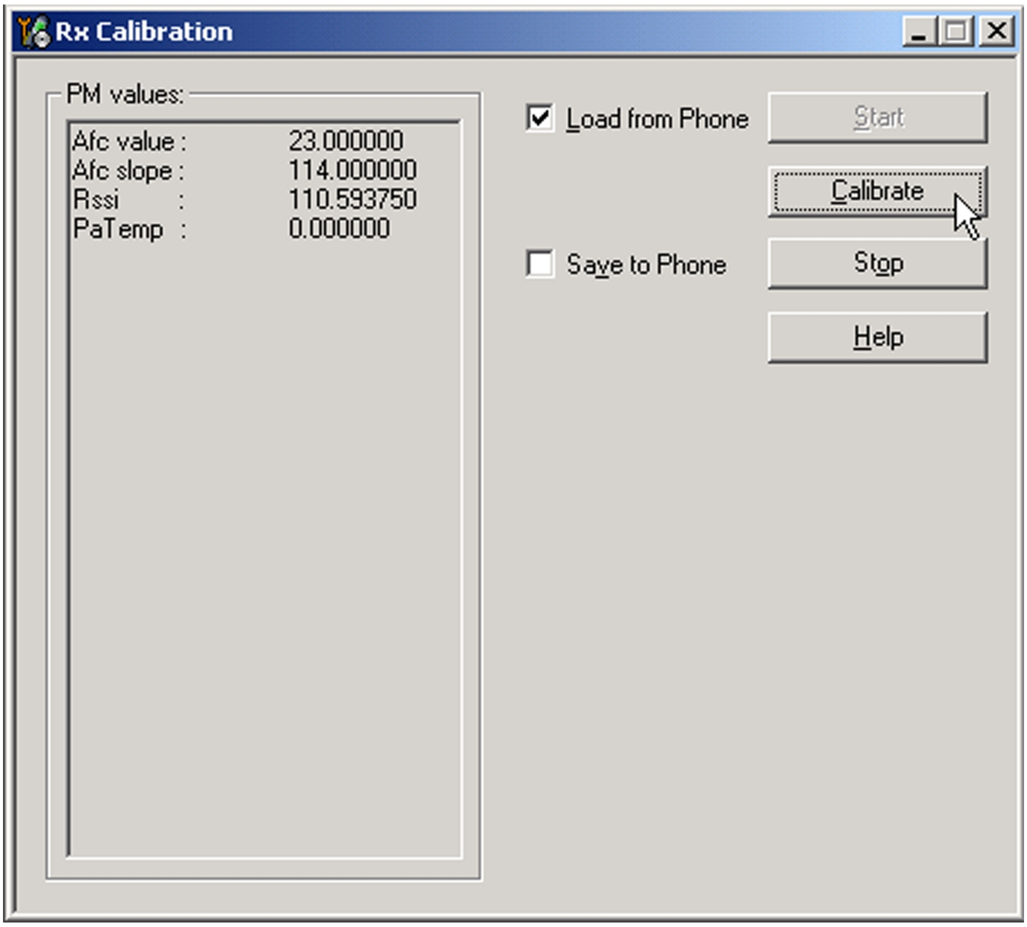
1. Connect the GSM connector of the module jig to a signal generator.
2. Start *Phoenix* service software.
3. From the **Operating mode** drop-down menu, set mode to **Local**.
4. Choose **Tuning→GSM→Rx Calibration** .
5. Check the **Load from Phone** check box, and uncheck **Save to Phone**.
6. From the **Band** drop-down menu, choose e.g. **GSM900**.
7. Click **Start**.



Operating mode: Local
☐ Change with Reset
Band: GSM 900
☑ Load from Phone
☐ Save to Phone

Phoenix
File
Edit
Product
Flashing
Testing
Tuning
Tools
Window
Help
Read
Rx Calibration
PM values:
Start
Calibrate
Stop
Help

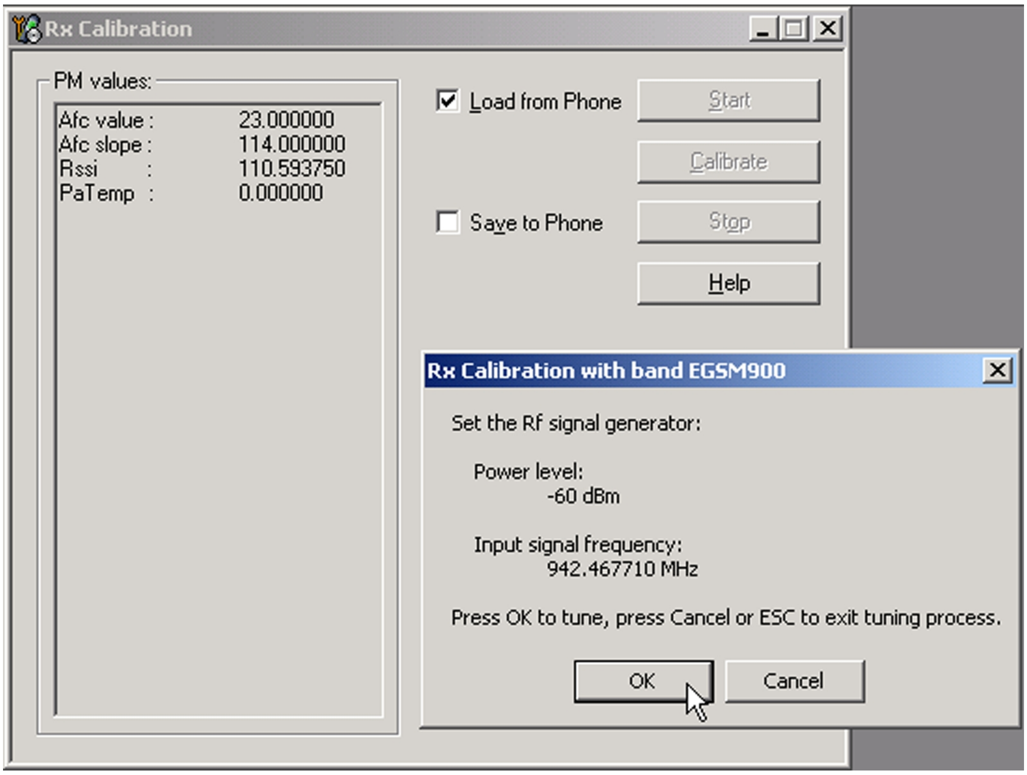
8. Click **Calibrate**.


Rx Calibration
PM values:
☑ Load from Phone
☐ Save to Phone
Start
Calibrate
Stop
Help

Afc value : 23.000000
Afc slope : 114.000000
Rssi : 110.593750
PaTemp : 0.000000

9. Connect the signal generator to the phone, and set frequency and amplitude as instructed in the **Rx Calibration with band EGSM900** pop-up window.

   Important: The calibration uses a non-modulated CW signal. Increase the signal generator level by cable attenuation and module jig probe attenuation.



PM values:
Afc value : 23.000000
Afc slope : 114.000000
Rssi : 110.593750
PaTemp : 0.000000

Rx Calibration with band EGSM900

Set the Rf signal generator:

Power level:
-60 dBm

Input signal frequency:
942.467710 MHz

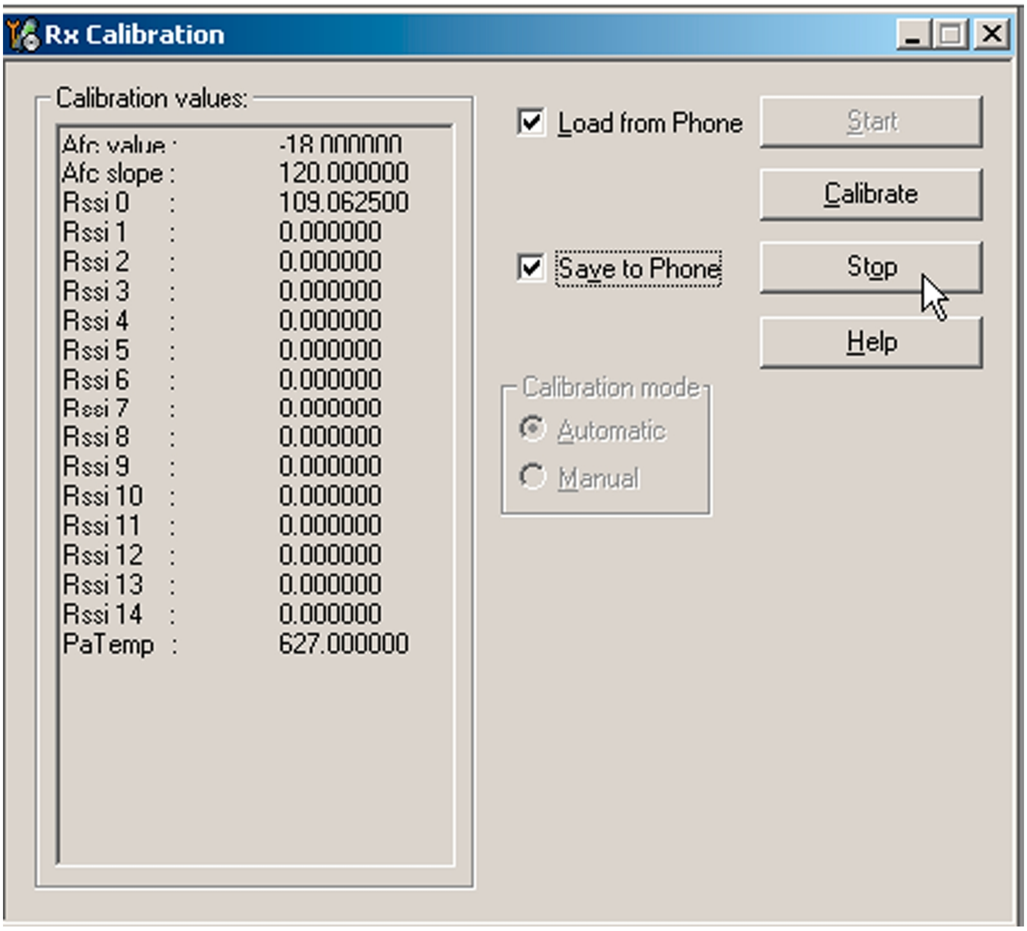
Press OK to tune, press Cancel or ESC to exit tuning process.

10. To perform the tuning, click **OK**.
11. Check that the tuning values are within the limits specified in the following table:

Table 12 RF tuning limits in Rx calibration

	Min	Typ	Max	Unit
GSM850				
AFC Value	-200	-105...62	200	
AFC slope	0	122	200	
RSSI0	106	107...110	114	dB
GSM900				
AFC Value	-200	-105...62	200	
AFC slope	0	122	200	
RSSI0	106	107...110	114	dB
GSM1800				
RSSI0	104	104...109	114	dB
GSM1900				
RSSI0	104	104...109	114	dB

12. To save values to the phone, check the **Save to Phone** check box, and click **Stop**.



Calibration values:

```
Afc value :     -18.000000
Afc slope :     120.000000
Rssi 0    :     109.062500
Rssi 1    :     0.000000
Rssi 2    :     0.000000
Rssi 3    :     0.000000
Rssi 4    :     0.000000
Rssi 5    :     0.000000
Rssi 6    :     0.000000
Rssi 7    :     0.000000
Rssi 8    :     0.000000
Rssi 9    :     0.000000
Rssi 10   :     0.000000
Rssi 11   :     0.000000
Rssi 12   :     0.000000
Rssi 13   :     0.000000
Rssi 14   :     0.000000
PaTemp    :     627.000000
```

☑ Load from Phone

☑ Save to Phone

Calibration mode

● Automatic

○ Manual

Next actions

Repeat steps 3 to 8 for GSM850, GSM1800 and GSM1900

Rx band filter response compensation (GSM)

Prerequisites

Rx calibration must be done before the Rx Band Filter Response Compensation

Context

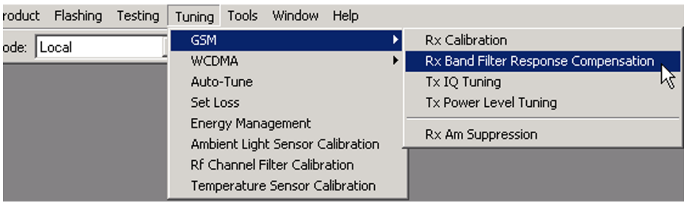
In each GSM Rx band, there’s a band rejecting filter in front of RF ASIC front end. The amplitude ripple caused by these filters causes ripple to the RSSI measurement and therefore calibration is needed.

The calibration has to be repeated for each GSM band.

Steps

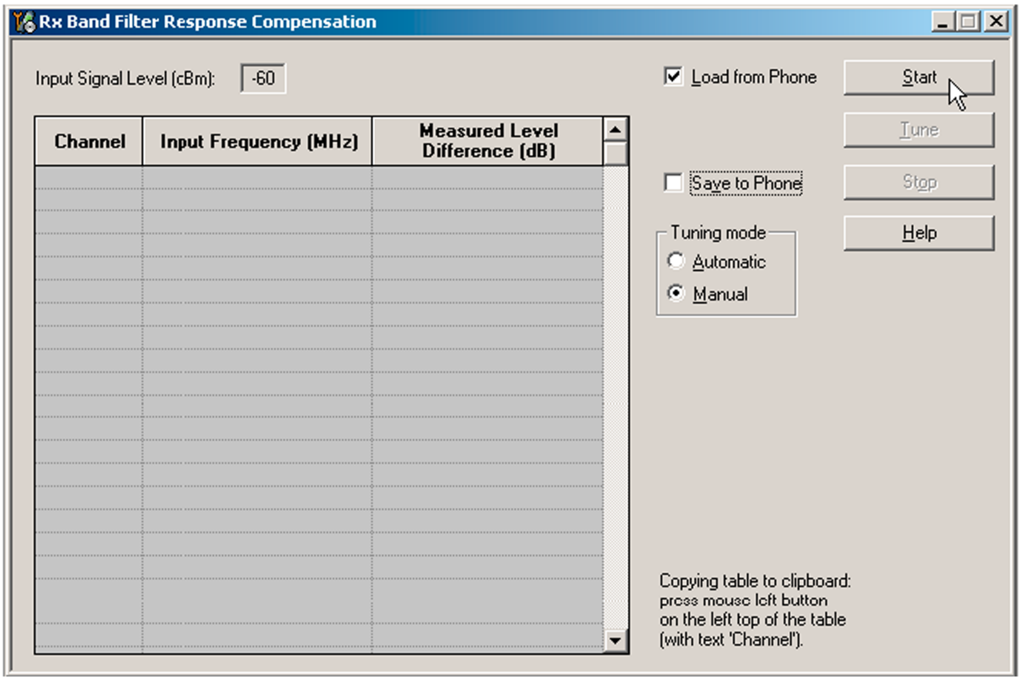
1. Connect module jig’s GSM connector to signal generator.
2. From the dropdown menus, set "Operating mode" to Local, "System mode" to GSM, and Band to GSM900.

3. From the Tuning menu, choose GSM -> Rx Band Filter Response Compensation.


roduct
Flashing
Testing
Tuning
Tools
Window
Help
ode:
Local
GSM
WCDMA
Auto-Tune
Set Loss
Energy Management
Ambient Light Sensor Calibration
Rf Channel Filter Calibration
Temperature Sensor Calibration
Rx Calibration
Rx Band Filter Response Compensation
Tx IQ Tuning
Tx Power Level Tuning
Rx Am Suppression

4. Check “Manual” and “Load from Phone” check boxes. Clear “Save to Phone” check box

5. Click Start.


Rx Band Filter Response Compensation
Start
Tune
Stop
Help

Input Signal Level (cBm): -60

☑ Load from Phone

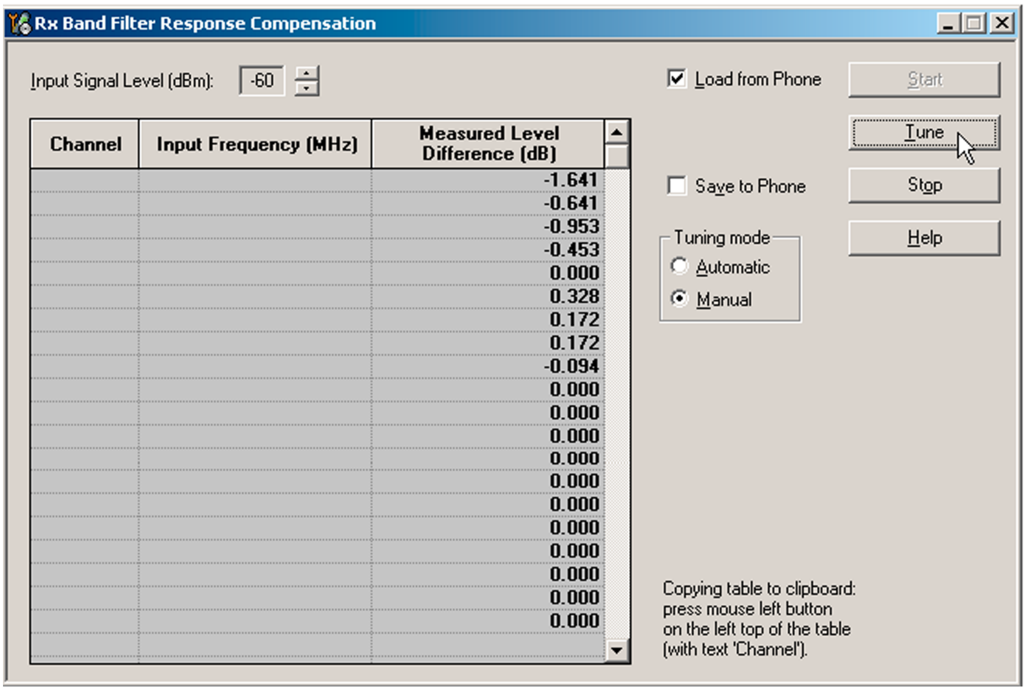
☐ Save to Phone

Tuning mode
○ Automatic
● Manual

Channel	Input Frequency (MHz)	Measured Level Difference (dB)

Copying table to clipboard:
press mouse left button
on the left top of the table
(with text 'Channel').

6. Click Tune.


Rx Band Filter Response Compensation
Start
Tune
Stop
Help

Input Signal Level (dBm): -60

☑ Load from Phone

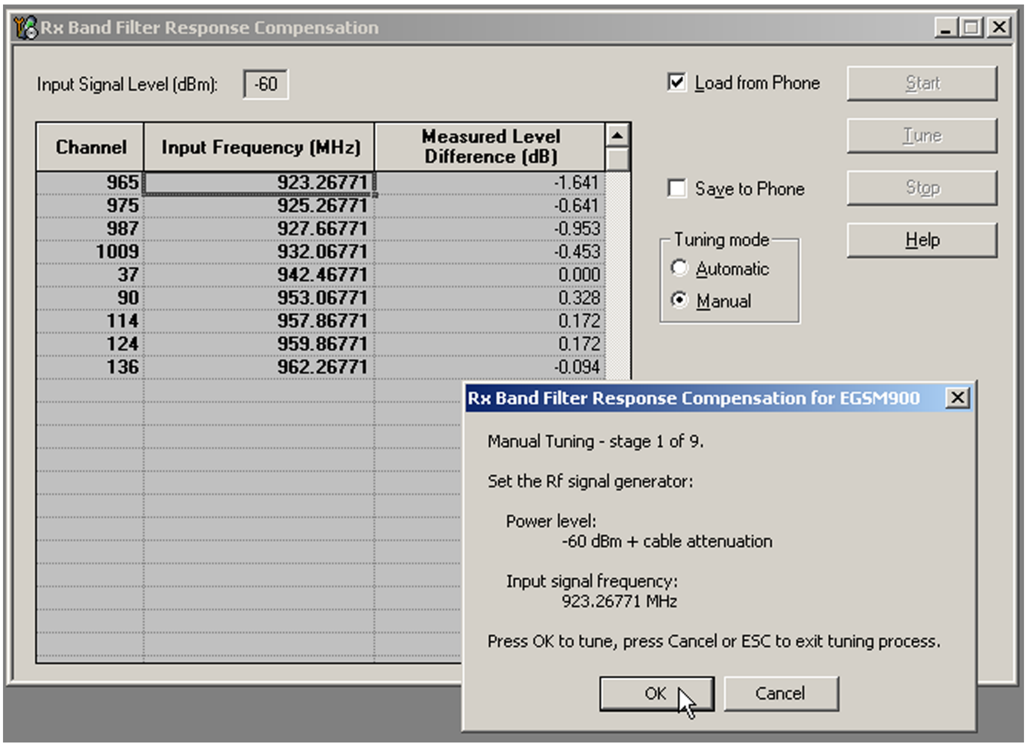
☐ Save to Phone

Tuning mode
○ Automatic
● Manual

Channel	Input Frequency (MHz)	Measured Level Difference (dB)
		-1.641
		-0.641
		-0.953
		-0.453
		0.000
		0.328
		0.172
		0.172
		-0.094
		0.000
		0.000
		0.000
		0.000
		0.000
		0.000
		0.000
		0.000
		0.000
		0.000
		0.000

Copying table to clipboard:
press mouse left button
on the left top of the table
(with text 'Channel').

7. Connect signal generator to the phone and set frequency and amplitude as instructed in the "Rx Band Filter Response Compensation for EGSM900" popup window.


Rx Band Filter Response Compensation
Start
Tune
Stop
Help
Rx Band Filter Response Compensation for EGSM900
OK
Cancel

Input Signal Level (dBm): -60

☑ Load from Phone

☐ Save to Phone

Tuning mode
○ Automatic
● Manual

Channel	Input Frequency (MHz)	Measured Level Difference (dB)
965	923.26771	-1.641
975	925.26771	-0.641
987	927.66771	-0.953
1009	932.06771	-0.453
37	942.46771	0.000
90	953.06771	0.328
114	957.86771	0.172
124	959.86771	0.172
136	962.26771	-0.094

Manual Tuning - stage 1 of 9.

Set the Rf signal generator:

Power level:
-60 dBm + cable attenuation

Input signal frequency:
923.26771 MHz

Press OK to tune, press Cancel or ESC to exit tuning process.

8. To perform tuning, click OK.

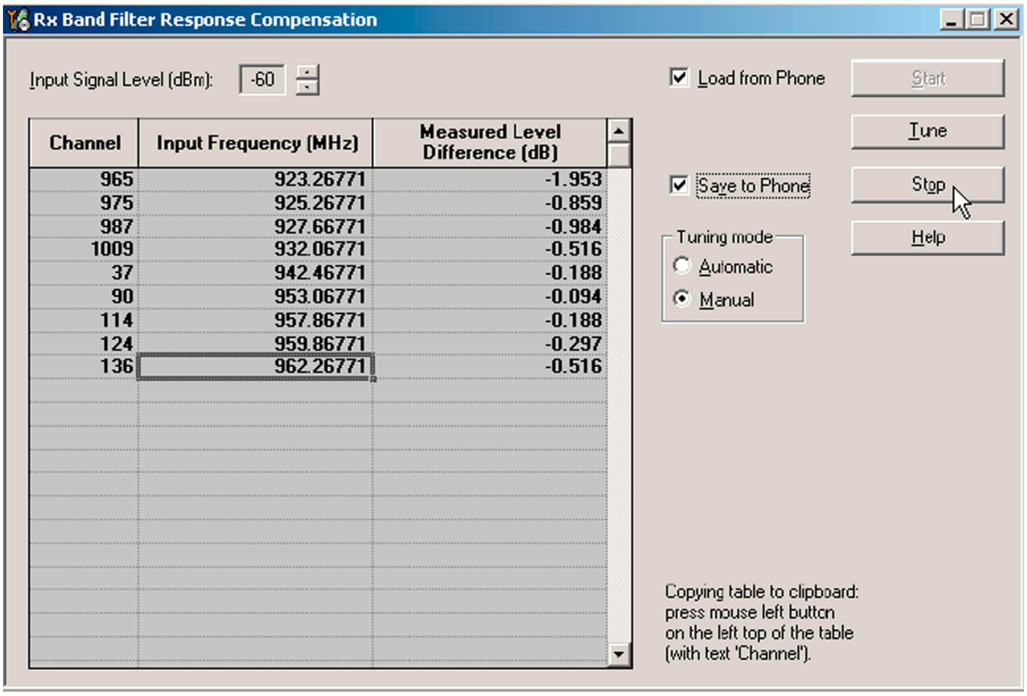
9. Go through all 9 frequencies.

10. Check that the tuning values are within the limits specified in this table:

	Min	Typ	Max	Unit
GSM850				
Ch. 118 / 867.26771 MHz	-10	-1	5	dB
Ch. 128 / 869.26771 MHz	-3	0	5	dB
Ch. 140 / 871.66771 MHz	-3	0	5	dB
Ch. 172 / 878.06771 MHz	-3	0	5	dB
Ch. 190 / 881.66771 MHz	-3	0	5	dB
Ch. 217 / 887.06771 MHz	-3	0	5	dB
Ch. 241 / 891.86771 MHz	-3	0	5	dB
Ch. 251 / 893.86771 MHz	-3	0	5	dB
Ch. 261/ 895.86771 MHz	-10	-1	5	dB
GSM900				
Ch. 965 / 923.26771 MHz	-10	-1	5	dB
Ch. 975 / 925.26771 MHz	-3	0	5	dB
Ch. 987 / 927.66771 MHz	-3	0	5	dB
Ch. 1009 / 932.06771 MHz	-3	0	5	dB
Ch. 37 / 942.46771 MHz	-3	0	5	dB
Ch. 90 / 953.06771 MHz	-3	0	5	dB
Ch. 114 / 957.86771 MHz	-3	0	5	dB
Ch. 124 / 959.86771 MHz	-3	0	5	dB
Ch. 136 / 962.26771 MHz	-10	-1	5	dB
GSM1800				

	Min	Typ	Max	Unit
Ch. 497 / 1802.26771 MHz	-10	-1	5	dB
Ch. 512 / 1805.26771 MHz	-3	0	5	dB
Ch. 535 / 1809.86771 MHz	-3	0	5	dB
Ch. 606 / 1824.06771 MHz	-3	0	5	dB
Ch. 700 / 1842.86771 MHz	-3	0	5	dB
Ch. 791 / 1861.06771 MHz	-3	0	5	dB
Ch. 870 / 1876.86771 MHz	-3	0	5	dB
Ch. 885 / 1879.86771 MHz	-3	0	5	dB
Ch. 908 / 1884.46771 MHz	-10	-1	5	dB
GSM1900				
Ch. 496 / 1927.06771 MHz	-10	-1	5	dB
Ch. 512 / 1930.26771 MHz	-3	0	5	dB
Ch. 537 / 1935.26771 MHz	-3	0	5	dB
Ch. 586 / 1945.06771 MHz	-3	0	5	dB
Ch. 661 / 1960.06771 MHz	-3	0	5	dB
Ch. 736 / 1975.06771 MHz	-3	0	5	dB
Ch. 794 / 1986.66771 MHz	-3	0	5	dB
Ch. 810 / 1989.86771 MHz	-3	0	5	dB
Ch. 835 / 1994.86771 MHz	-10	-1	5	dB

11. Check the "Save to Phone" check box and click Stop if the values are within the limits.


Rx Band Filter Response Compensation
Start
Tune
Stop
Help

Input Signal Level (dBm): -60

☑ Load from Phone

☑ Save to Phone

Tuning mode
○ Automatic
● Manual

Channel	Input Frequency (MHz)	Measured Level Difference (dB)
965	923.26771	-1.953
975	925.26771	-0.859
987	927.66771	-0.984
1009	932.06771	-0.516
37	942.46771	-0.188
90	953.06771	-0.094
114	957.86771	-0.188
124	959.86771	-0.297
136	962.26771	-0.516

Copying table to clipboard:
press mouse left button
on the left top of the table
(with text 'Channel').

Next actions

Repeat the steps 4 to 10 for GSM850, GSM1800 and GSM1900.

GSM transmitter tunings

Tx IQ tuning (GSM)

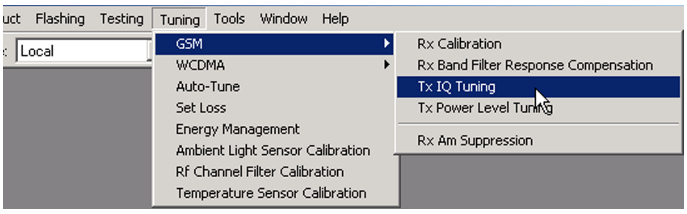
Context

The Tx path branches to I and Q signals at RF I/Q modulator. Modulator and analog hardware located after it cause unequal amplitude and phase disturbance to I and Q signal paths. Tx IQ tuning tuning balances the I and Q branches.

Tx IQ tuning must be performed on all GSM bands. .

Steps

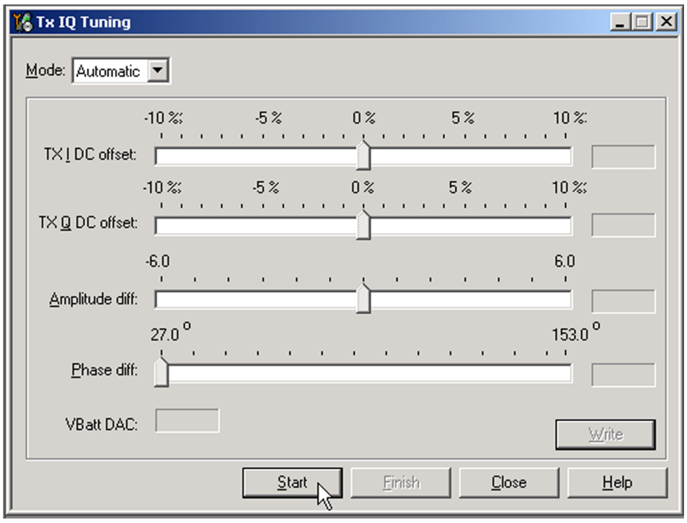
1. From the dropdown menus, set "Operating mode" to Local, "System mode" to GSM, and Band to GSM900.
2. From the Tuning menu, choose GSM -> Tx IQ Tuning.


uct
Flashing
Testing
Tuning
Tools
Window
Help
Local
GSM
WCDMA
Auto-Tune
Set Loss
Energy Management
Ambient Light Sensor Calibration
RF Channel Filter Calibration
Temperature Sensor Calibration
Rx Calibration
Rx Band Filter Response Compensation
Tx IQ Tuning
Tx Power Level Tuning
Rx Am Suppression

3. Set Mode to Automatic and Edge to Off.
4. Click Start.

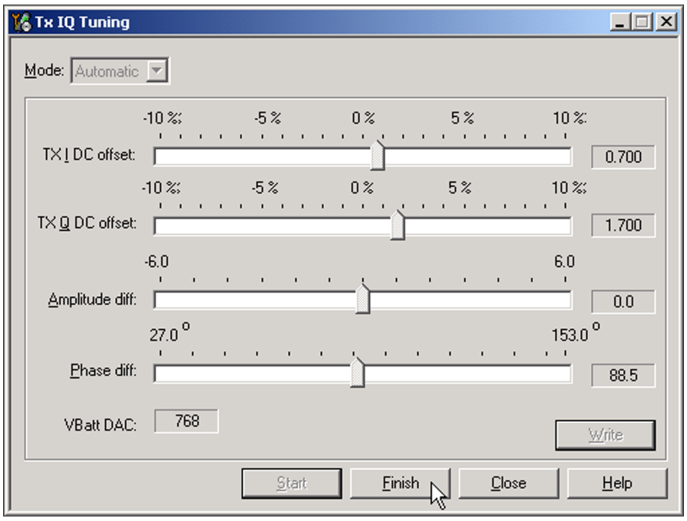
   Wait until automatic tuning has finished and moved the sliders.

   Values are written to the phone memory automatically.


Tx IQ Tuning
-10 %
-5 %
0 %
5 %
10 %
TX I DC offset:
TX Q DC offset:
-6.0
6.0
Amplitude diff:
27.0 °
153.0 °
Phase diff:
VBatt DAC:
Write
Start
Finish
Close
Help

Mode: Automatic

5. When the values have been written to the phone memory, click the Finish button to end the tuning.


Tx IQ Tuning
-10 %
-5 %
0 %
5 %
10 %
-6.0
6.0
27.0 °
153.0 °
Write
Start
Finish
Close
Help

Mode: Automatic
TX I DC offset: 0.700
TX Q DC offset: 1.700
Amplitude diff: 0.0
Phase diff: 88.5
VBatt DAC: 768

6. Change band to GSM850 and repeat steps 4 to 5.
7. Change band to GSM1800 and repeat steps 4 to 5.
8. Change band to GSM1900 and repeat steps 4 to 5.
9. To close the tuning window, click Close.

Next actions

Tuning sliders should be close to the center of the scale after the tuning and within the limits specified in the table below. If they are not within the limits, check Tx IQ quality manually.

	Min	Typ	Max	Unit
GSM850				
I DC offset / Q DC offset	-6	-4	6	%
Ampl	-1	0	1	dB
Phase	85	90	95	○
GSM900				

	Min	Typ	Max	Unit
I DC offset / Q DC offset	-6	-4	6	%
Ampl	-1	0	1	dB
Phase	85	90	95	○
GSM1800/GSM1900				
I/Q DC	-6	0.5	6	%
Ampl	-1	0	1	dB
Phase	95	100	110	○

Tx power level tuning (GSM)

Context

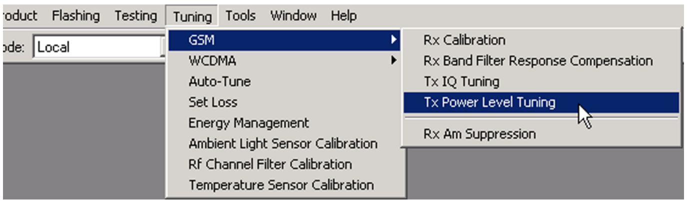
Because of variations at IC process and discrete component values, actual transmitter RF gain of each phone is different. Tx power level tuning is used to find out mapping factors called 'power coefficients'. These adjust the GSM transmitter output power to fulfill the specifications.

For EDGE transmission the bias settings of the FEM are adjusted in order to improve linearity. This affects the PA gain and hence the power levels have to be aligned separately for EDGE transmission.

Tx power level tuning has to be performed on all GSM bands.

Steps

1. Connect the phone to a spectrum analyzer.
2. From the dropdown menus, set "Operating mode" to Local, "System mode" to GSM, and Band to GSM900.
3. From the Tuning menu, choose GSM -> Tx Power Level Tuning.


oduct
Flashing
Testing
Tuning
Tools
Window
Help
ode:
Local
GSM
WCDMA
Auto-Tune
Set Loss
Energy Management
Ambient Light Sensor Calibration
RF Channel Filter Calibration
Temperature Sensor Calibration
Rx Calibration
Rx Band Filter Response Compensation
Tx IQ Tuning
Tx Power Level Tuning
Rx Am Suppression

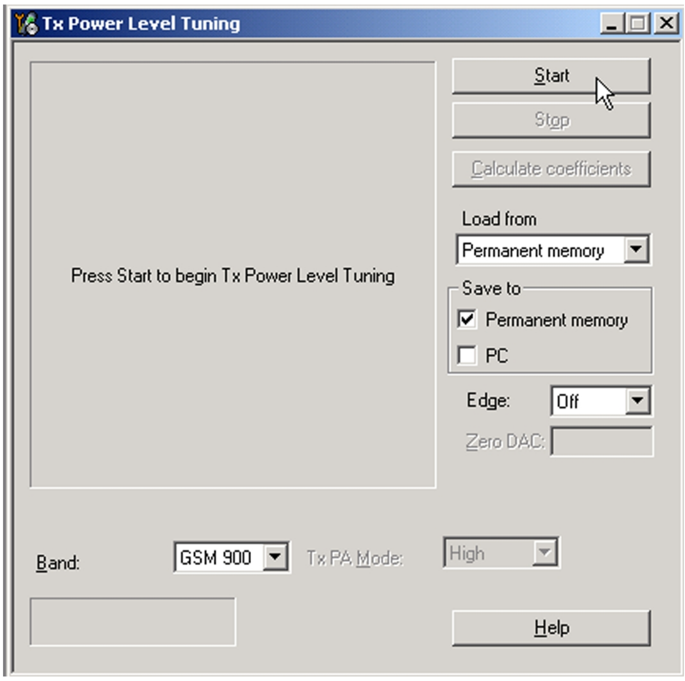
4. Set Mode to Automatic and Edge to Off.
5. Set the spectrum analyzer for power level tuning:

Frequency	channel frequency (836.6MHz GSM850, 897.4MHz GSM900, 1747.8MHz GSM1800, 1880MHz GSM1900)
Span	0 Hz
Sweep time	2ms
Trigger	Video triggering (-10dBm)
Resolution BW	3MHz
Video BW	3MHz

Reference level offset	sum cable attenuation with module jig attenuation
Reference level	33dBm

A power meter with a peak power detector can be also used. Remember to take the attenuations in the account!

6. Click Start.


Tx Power Level Tuning
Start
Stop
Calculate coefficients
Help

Press Start to begin Tx Power Level Tuning

Load from: Permanent memory

Save to:
☑ Permanent memory
☐ PC

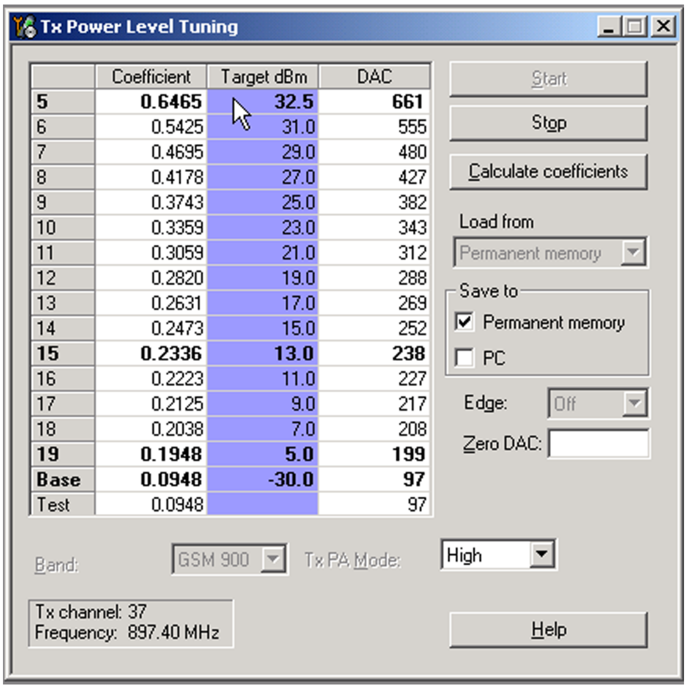
Edge: Off

Zero DAC:

Band: GSM 900

Tx PA Mode: High

7. Adjust power levels 5, 15 and 19 to correspond the "Target dBm" column by pressing + or – keys.


Tx Power Level Tuning
Start
Stop
Calculate coefficients
Help

	Coefficient	Target dBm	DAC
5	**0.6465**	**32.5**	**661**
6	0.5425	31.0	555
7	0.4695	29.0	480
8	0.4178	27.0	427
9	0.3743	25.0	382
10	0.3359	23.0	343
11	0.3059	21.0	312
12	0.2820	19.0	288
13	0.2631	17.0	269
14	0.2473	15.0	252
15	**0.2336**	**13.0**	**238**
16	0.2223	11.0	227
17	0.2125	9.0	217
18	0.2038	7.0	208
19	**0.1948**	**5.0**	**199**
Base	**0.0948**	**-30.0**	**97**
Test	0.0948		97

Load from: Permanent memory

Save to:
☑ Permanent memory
☐ PC

Edge: Off

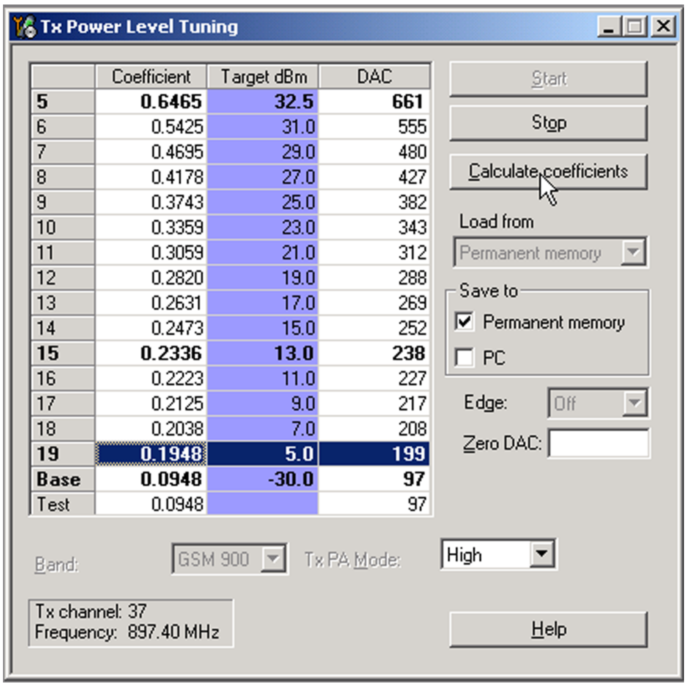
Zero DAC:

Band: GSM 900

Tx PA Mode: High

Tx channel: 37
Frequency: 897.40 MHz

8. Click Calculate Coefficients.



	Coefficient	Target dBm	DAC
5	**0.6465**	**32.5**	**661**
6	0.5425	31.0	555
7	0.4695	29.0	480
8	0.4178	27.0	427
9	0.3743	25.0	382
10	0.3359	23.0	343
11	0.3059	21.0	312
12	0.2820	19.0	288
13	0.2631	17.0	269
14	0.2473	15.0	252
15	**0.2336**	**13.0**	**238**
16	0.2223	11.0	227
17	0.2125	9.0	217
18	0.2038	7.0	208
19	**0.1948**	**5.0**	**199**
Base	**0.0948**	**-30.0**	**97**
Test	0.0948		97

Load from: Permanent memory

Save to:
☑ Permanent memory
☐ PC

Edge: Off

Zero DAC:

Band: GSM 900

Tx PA Mode: High

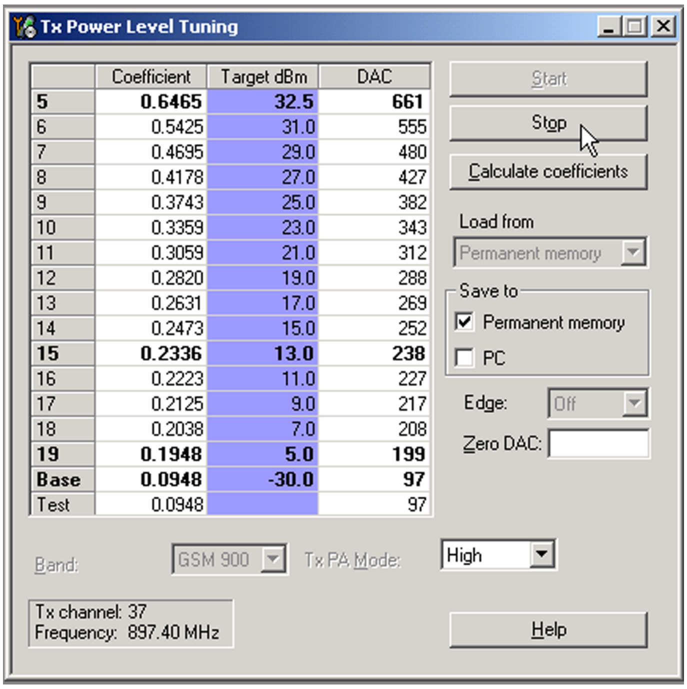
Tx channel: 37
Frequency: 897.40 MHz

9. Check that the coeffiecient values are within the limits specified in the following table.

	Min	Typ	Max
GSM850 EDGE off			
PL5 coefficient	0.45	0.626	0.73
PL15 coefficient		0.234	
PL19 coefficient	0.12	0.195	0.3
GSM850 EDGE on			
PL8 coefficient	0.35	0.419	0.6
PL15 coefficient		0.247	
PL19 coefficient	0.12	0.204	0.3
GSM900 EDGE off			
PL5 coefficient	0.45	0.626	0.73
PL15 coefficient		0.234	
PL19 coefficient	0.12	0.195	0.3
GSM900 EDGE on			
PL8 coefficient	0.35	0.419	0.6
PL15 coefficient		0.247	
PL19 coefficient	0.12	0.204	0.3
GSM1800 EDGE off			
PL0 coefficient	0.45	0.51	0.7

	Min	Typ	Max
PL11 coefficient		0.219	
PL15 coefficient	0.12	0.185	0.3
GSM1800 EDGE on			
PL2 coefficient	0.35	0.394	0.6
PL11 coefficient		0.23	
PL15 coefficient	0.12	0.194	0.3
GSM1900 EDGE off			
PL0 coefficient	0.45	0.482	0.7
PL11 coefficient		0.218	
PL15 coefficient	0.12	0.184	0.3
GSM1900 EDGE on			
PL2 coefficient	0.35	0.377	0.6
PL11 coefficient		0.23	
PL15 coefficient	0.12	0.193	0.3

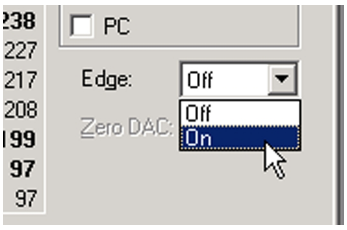
If the values are within the limits, check that the "Save to Phone Permanent Memory" check box is checked and click Stop.



	Coefficient	Target dBm	DAC
5	**0.6465**	**32.5**	**661**
6	0.5425	31.0	555
7	0.4695	29.0	480
8	0.4178	27.0	427
9	0.3743	25.0	382
10	0.3359	23.0	343
11	0.3059	21.0	312
12	0.2820	19.0	288
13	0.2631	17.0	269
14	0.2473	15.0	252
15	**0.2336**	**13.0**	**238**
16	0.2223	11.0	227
17	0.2125	9.0	217
18	0.2038	7.0	208
19	**0.1948**	**5.0**	**199**
Base	**0.0948**	**-30.0**	**97**
Test	0.0948		97

Load from: Permanent memory
Save to:
☑ Permanent memory
☐ PC
Edge: Off
Zero DAC:
Band: GSM 900
Tx PA Mode: High
Tx channel: 37
Frequency: 897.40 MHz

10. Set **Edge** mode on and start tuning again. Change video averaging to 50.



11. Tune EDGE power levels to the corresponding target power levels.

    Only power levels **8**, **15** and **19** are tuned in GSM900 and **2**, **10** and **15** in GSM1800/1900. The rest are calculated by clicking the Calculate Coefficients button. Check the coefficients against the RF tuning limits table presented in Step 9.

12. When the tuning is completed, click Stop.

Next actions

Repeat steps 4 to 9 for GSM1800 and GSM1900. On those bands only power levels **0**, **11** and **15** need to be tuned.

8 — System Module

(This page left intentionally blank.)

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Baseband description

System module block diagram

RM-198 has two blocks, upper block and lower block. The upper block consists of upper PWB module. The lower block consists of Engine (BB/RF) PWB module.

The upper block is connected to the lower block (BB/RF module) via a 40-pin connector and a flex cable.

Most of the BB parts (also IHF, RF and BT) are on the topside of the Engine Module. FM parts, external audio small components, MR sensor, upper block connector and keyboard are on the backside of the Engine Module. Accessories and charger can be connected via the Pop-Port™ connector and the charger connector at the bottom of the phone.

Upper PWB Module consists of two Displays, Earpiece, Camera, HWA, two DC/DC converters and one regulator and connector to Engine Module.

> **Note:** In this description, user interface HW (UI HW) covers display, camera, keyboard and keyboard backlight. Note also, that the RM-198 can be assembled with or without the HAC (Hearing Aid Coil).

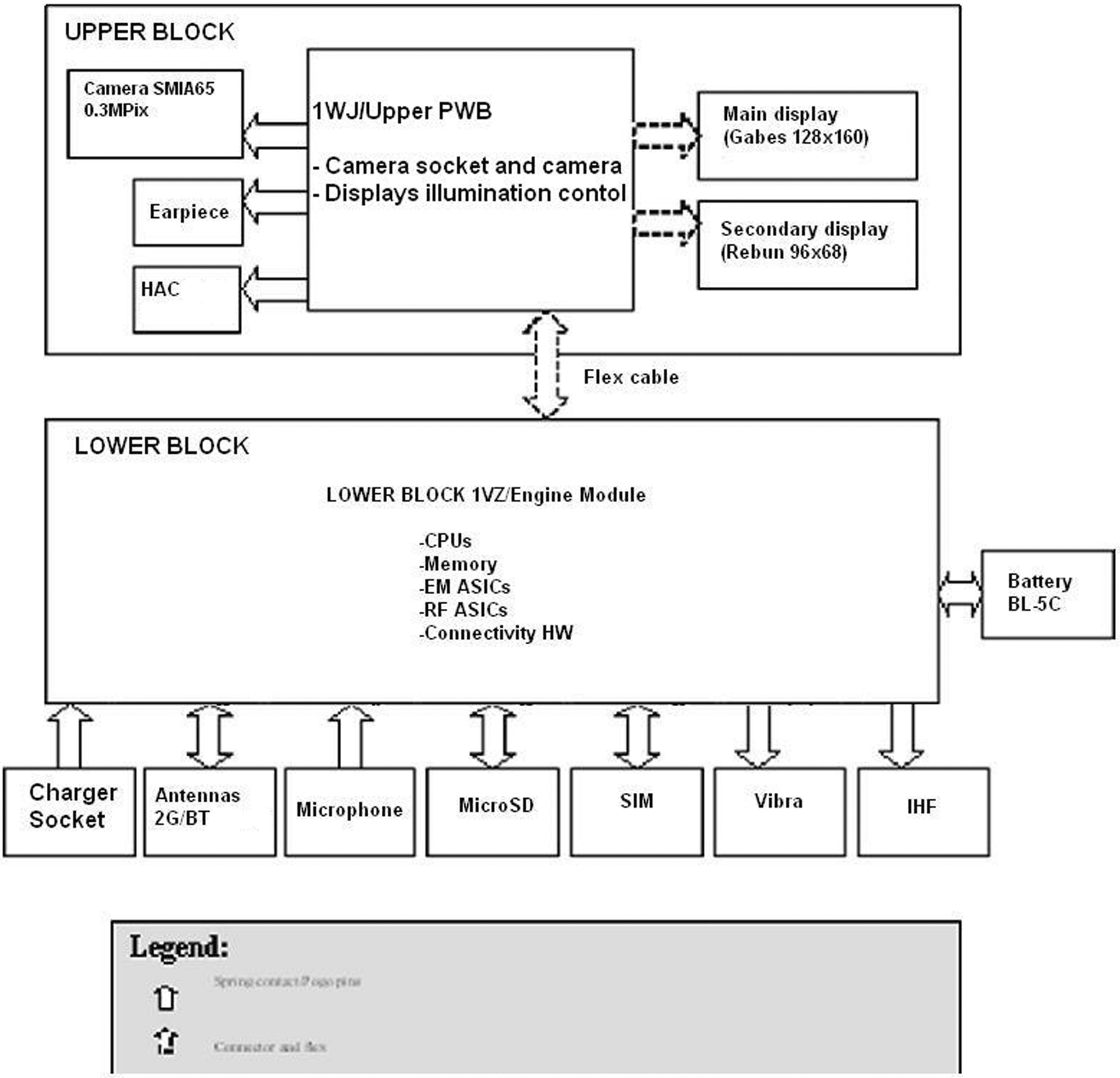

UPPER BLOCK
Camera SMIA65
0.3MPix
Earpiece
HAC
1WJ/Upper PWB
- Camera socket and camera
- Displays illumination contol
Main display
(Gabes 128x160)
Secondary display
(Rebun 96x68)
Flex cable
LOWER BLOCK
LOWER BLOCK 1VZ/Engine Module
-CPUs
-Memory
-EM ASICs
-RF ASICs
-Connectivity HW
Battery
BL-5C
Charger
Socket
Antennas
2G/BT
Microphone
MicroSD
SIM
Vibra
IHF
Legend:
Spring contact/Pogo pins
Connector and flex

Figure 53 System level block diagram

Baseband functional description

Digital baseband consists of ISA based modem and application sections. Modem functionality is in RAPGSM ASIC.

The modem section consists of RAPGSM ASIC and NOR Flash and DRAM memory as the core. NOR Flash and DRAM memories are in one package (Combo) RAPGSM supports cellular protocols of GSM (minimum EDGE glass 10, GPRS phase2). Modem DRAM memory has 128Mbits of memory and NOR flash has 256Mbits of memory. RAPGSM operates with the system clock of 38.4 MHz, which comes from the VCTCXO.

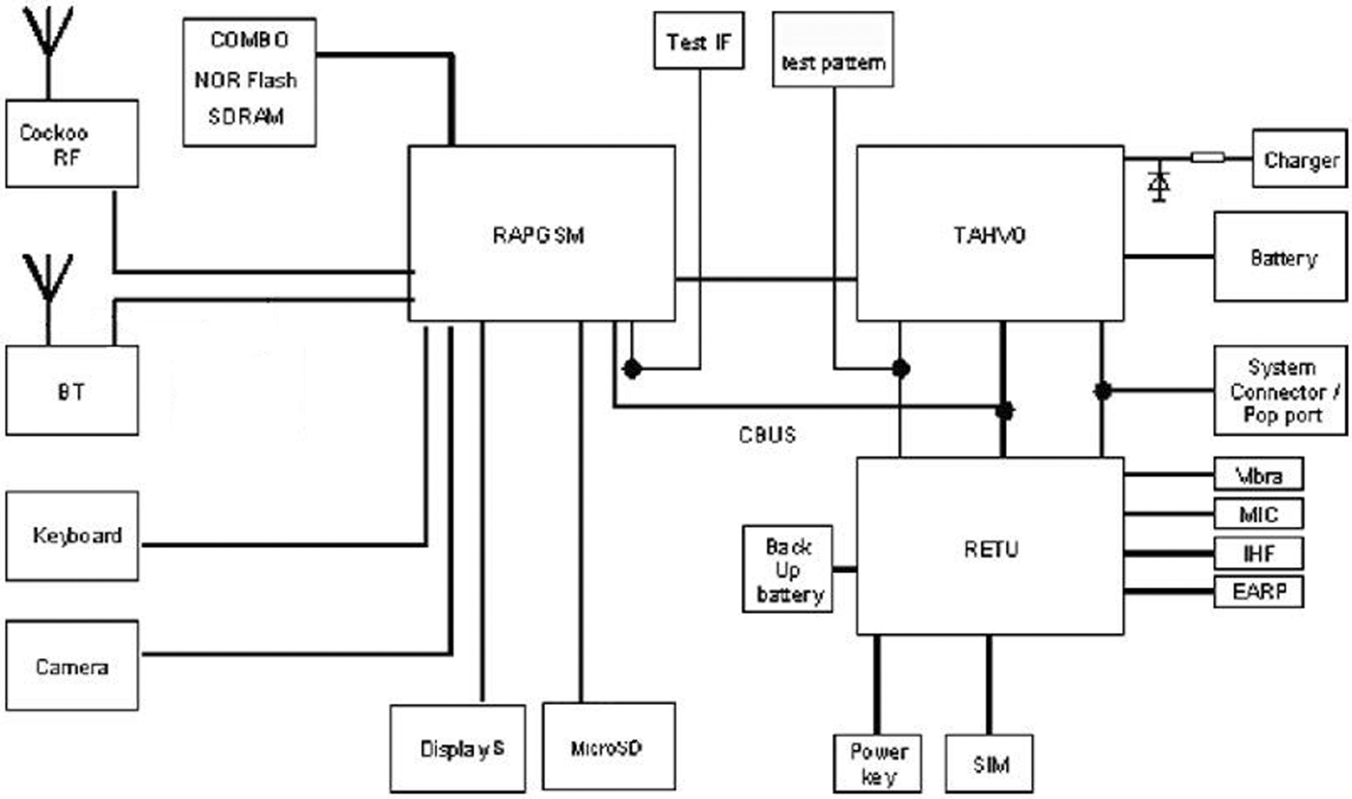

Cockoo RF
COMBO
NOR Flash
SDRAM
Test IF
test pattern
Charger
RAPGSM
TAHVO
Battery
BT
System Connector / Pop port
CBUS
Vibra
MIC
IHF
EARP
Keyboard
Back Up battery
RETU
Camera
DisplayS
MicroSD
Power key
SIM

Figure 54 RM-198 baseband functional block diagram

Absolute maximum ratings

Signal	Min	Nom	Max	Unit	Notes
Battery voltage (idle)	-0.3		+4.5	V	Battery voltage maximum value is specified during charging is active
Battery voltage (Call)			+4.3	V	Battery voltage maximum value is specified during charging is active
Charger input voltage	-0.3		+16V	V	
Back-Up supply voltage	0	2.5	2.7	V	Maximum capacity of the backup power supply assumed to be 4 µAh.

Phone modes of operation

Mode	Description
NO_SUPPLY	(dead) mode means that the main battery is not present or its voltage is too low (below EM ASIC (N2200) master reset threshold) and that the back-up battery voltage is too low.
BACK_UP	The main battery is not present or its voltage is too low but back-up battery voltage is adequate and the 32kHz oscillator is running (RTC is on).

Mode	Description
PWR_OFF	In this mode (warm), the main battery is present and its voltage is over EM ASIC (N2200) master reset threshold. All regulators are disabled, PurX is on low state, the RTC is on and the oscillator is on. PWR_OFF (cold) mode is almost the same as PWR_OFF (warm), but the RTC and the oscillator are off.
RESET	RESET mode is a synonym for start-up sequence. RESET mode uses 32kHz clock to count the REST mode delay (typically 16ms).
SLEEP	SLEEP mode is entered only from PWR_ON mode with the aid of SW when the system's activity is low.

Voltage limits

Parameter	Description	Value
VMSTR	Master reset threshold (EM ASIC N2200)	2.2V (typ.)
VMSTR+	Threshold for charging, rising (EM ASIC N2300)	2.1V (typ.)
VMSTR-	Threshold for charging, falling (EM ASIC N2300)	1.9V (typ.)
VCOFF+	Hardware cutoff (rising)	2.9V (typ.)
VCOFF-	Hardware cutoff (falling)	2.6V (typ.)
SWCOFF	SW cutoff limit	~3.2V

Power key

The system boots up when power key is pressed (adequate battery voltage, VBAT, present).

Power down can be initiated by pressing the power key again (the system is powered down with the aid of SW).

Power distribution

Power supply components:

- RETU
- TAHVO
- BT LDO
- MicroSD LDO
- backlight SMPSs

All the above are powered by the main battery voltage.

Battery voltage is also used on the RF side for power amplifiers (GSM PA) and for RF ASIC Ahne.

Discrete power supplies are used to generate 1.8V for the camera module, 2.85V for MicroSD card and max. 18V for backlight LEDs.

The device supports both 1.8V/3V SIM cards.

Bluetooth

Bluetooth provides a fully digital link for communication between a master unit and one or more slave units. The system provides a radio link that offers a high degree of flexibility to support various applications and product scenarios. Data and control interface for a low power RF module is provided. Data rate is regulated between the master and the slave.

The device Bluetooth is based on BC4 ROM1.0RDL BT chip.

USB

USB (Universal Serial Bus) provides a wired connectivity between host PC and peripheral devices.

USB is a differential serial bus for USB devices. USB controller (RAP) supports USB specification revision 2.0 with full speed USB (12 Mbps). The device is connected to the USB host through the system connector. The USB bus is hot plugged capable, which means that USB devices may be plugged in/out at any time.

MR sensor

MR sensor is used to monitor the position of the upper block in fold construction.

MR sensor detects the fold position. There is a magnet in fold mechanics under the display module and when the fold is closed MR sensor is in magnetic field.

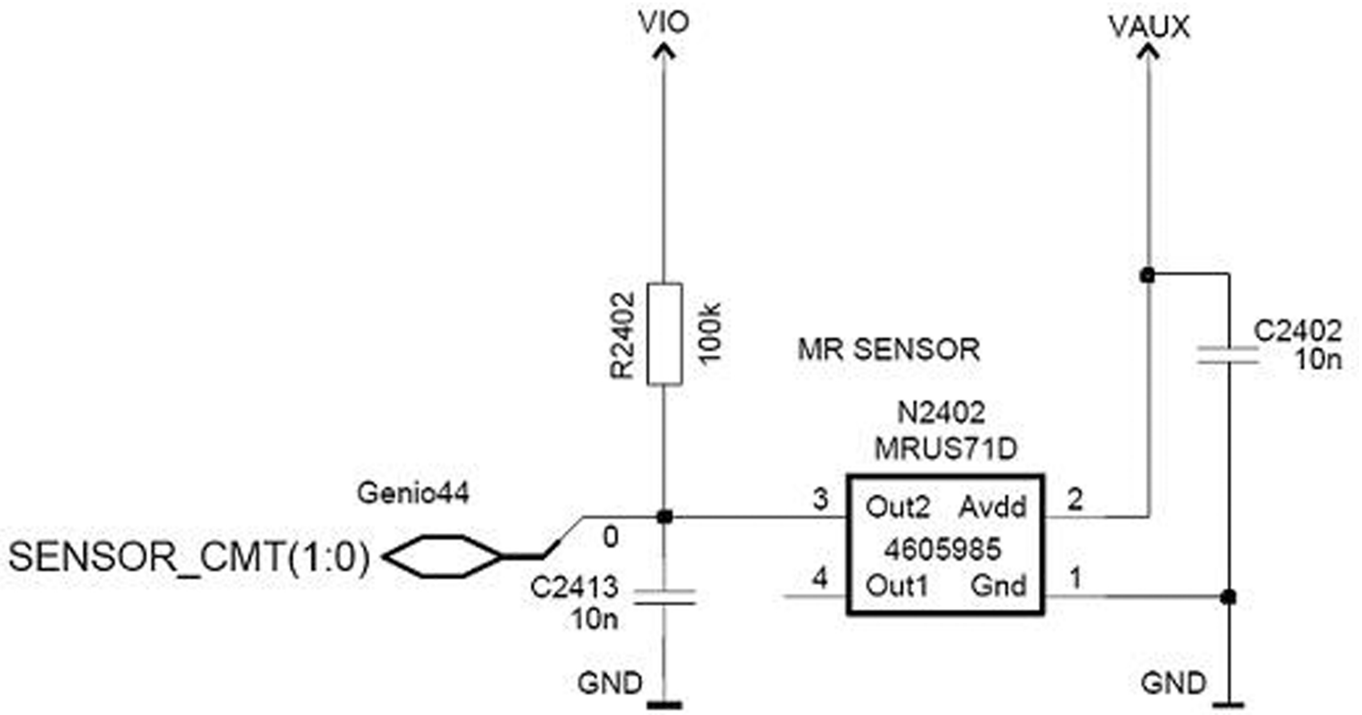


Figure 55 MR sensor connection

FM radio

The FM radio circuitry is implemented using a highly integrated radio TEA5760 N1C.

The antenna of the FM Radio is created with the headset. The wires of the headset are used as poles of the antenna.

Camera

The device uses SMIA65 camera module. SMIA65 is 0.3Mpixel with sensor resolution of 656 x 496.

The camera is powered by using VIO(1.8V) and VAUX(2.78V) voltages from the engine board.

Backup battery

When the main battery is not attached EM ASIC (N2200) goes in backup mode using back-up battery that supplies voltage to RTC in EM ASIC (N2200).

CBUS interface

CBUS is a "main" system control bus in BB5.0. RAP controls the functionality of EM ASIC (N2200) and EM ASIC (N2300) ASICs with CBUS.

CBUS is a four-wire half-duplex master-slave interface. In BB5.0 CBUS clock frequency is 2.4 MHz.

FBUS

USB and FBUS have multiplexed interface between EM ASIC (2300) and RAP.

ACI interface

The ACI (Accessory Control Interface) is a point-to-point, bi-directional, single line serial bus.

It has two main features: the insertion and removal detection of an accessory device and acting as a data bus between phone and accessory, intended for control purposes. A third function of ACI is to identify and authenticate the accessory.

VOUT interface

Accessory power is supplied by VOUT, a linear low drop-out regulator in EM ASIC (N2300) providing 2.5V at 90mA maximum when active (0.5mA in sleep).

Charger interface

Charging control and charge switch are situated in EM ASIC (N2300).

If the temperature rises too high and the thermal protection is activated, EM ASIC (N2300) goes to protection mode.

MicroSD interface

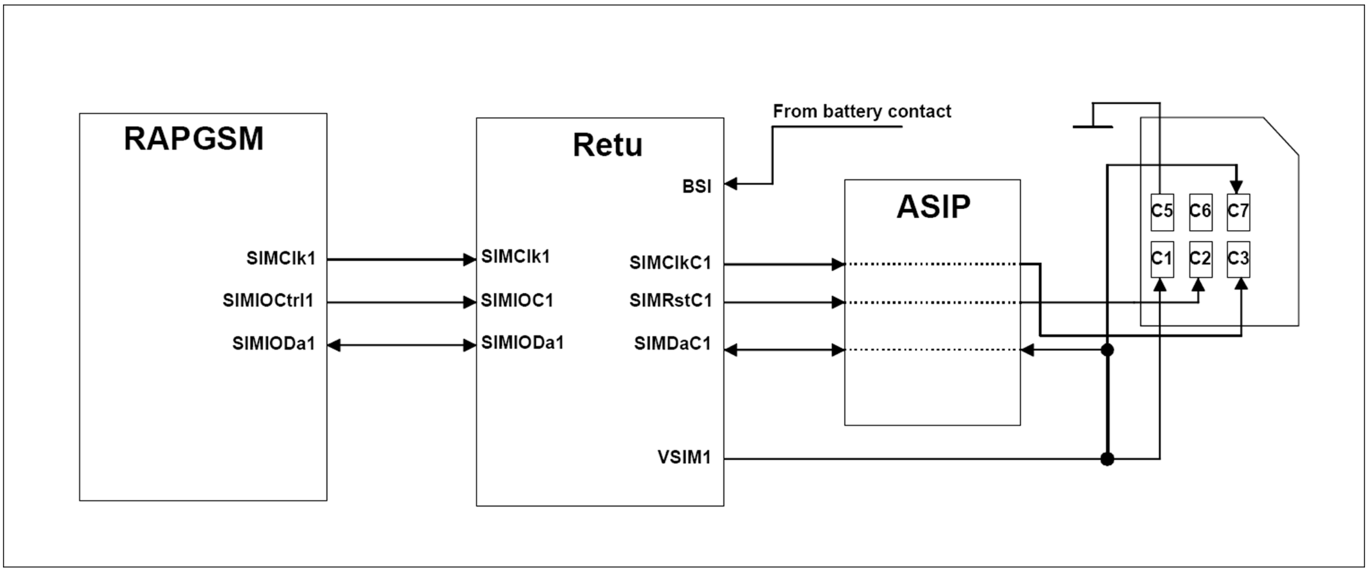
The MicroSD card interface is electrically and functionally compatible with the SD card interface.

SIM/USIM

The device has one SIM (Subscriber Identification Module) interface and the SIM card locates under the battery.

SIM interface consists of internal interface between RAP and EM ASIC (N2200) and an external interface between Retu and SIM contacts.

EM ASIC (N2200) external SIM IF connections and electrical characteristics between ASICs are shown in the picture.


RAPGSM
SIMClk1
SIMIOCtrl1
SIMIODa1
Retu
BSI
SIMClk1
SIMIOC1
SIMIODa1
SIMClkC1
SIMRstC1
SIMDaC1
VSIM1
From battery contact
ASIP
C5
C6
C7
C1
C2
C3

SIM interface voltage is first 1.8V when the SIM card is inserted and if the card does not response to the ATR (answer to reset) 3V interface voltage is used.

Battery interface

The battery interface supports a 3-pole battery interface. The interface consists of three connectors: VBAT, BSI and GND.

The BSI line is used to recognize the battery capacity by a battery internal pull down resistor.

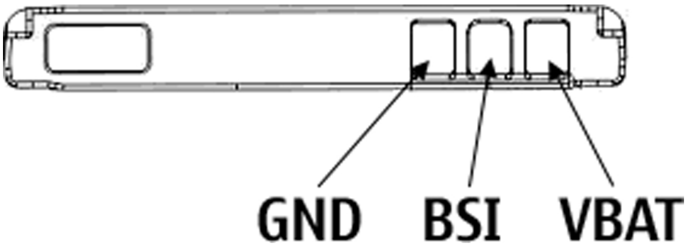

GND
BSI
VBAT

Figure 56 Battery pin order

Table 13 Battery interface connections

Pin	Signal	I/O	Engine connection		Notes
1	VBAT	->	EM ASIC N2200	VBAT	Battery voltage
2	BSI	->	EM ASIC N2200	BSI	Battery size indication (fixed resistor inside the battery pack)
3	GND		GND		Ground

Battery temperature is estimated by measuring separate battery temperature NTC via the BTEMP line, which is located on the transceiver PWB, at a place where the phone temperature is most stable.

For service purposes, the device SW can be forced into local mode by using pull down resistors connected to the BSI line.

User interface

Main display

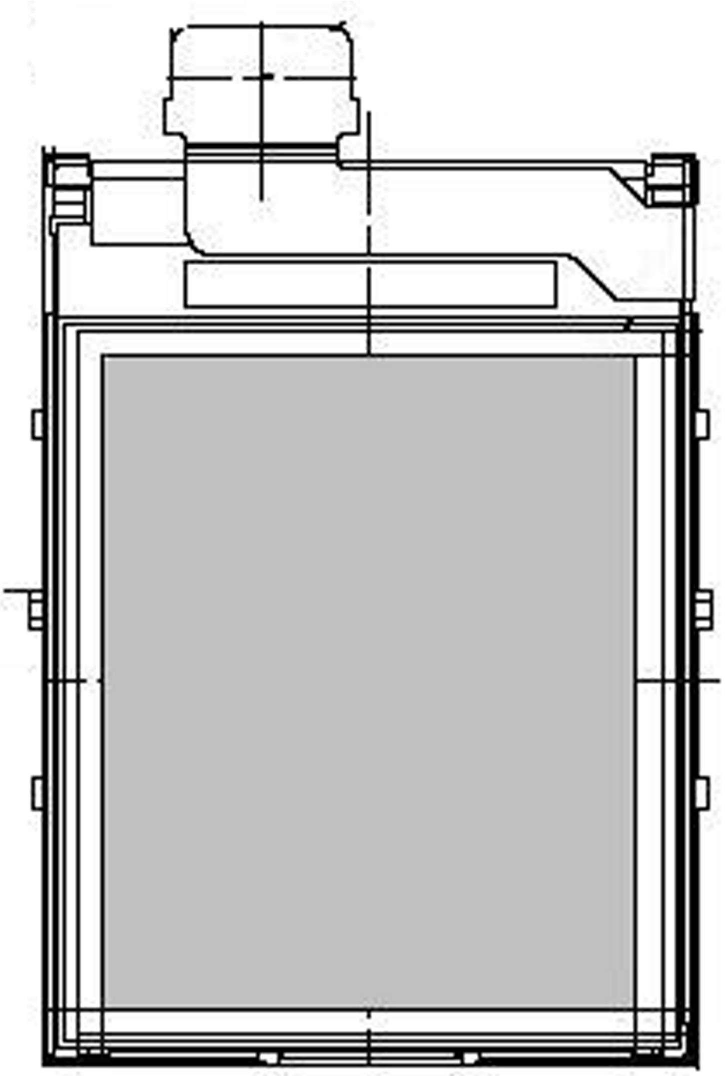


Figure 57 Main display LCD module

Display features:

- Main display: 128x160 262k CSTN passive LCD.
- Transmissive type, screen is 'black' when display illumination is OFF.
- Active area is 28.032 mm x 35.040 mm.
- Partial display function Power saving by pausing display process on part of the screen.
- Build-in RAM capacity 128x160x18bit

Cover display

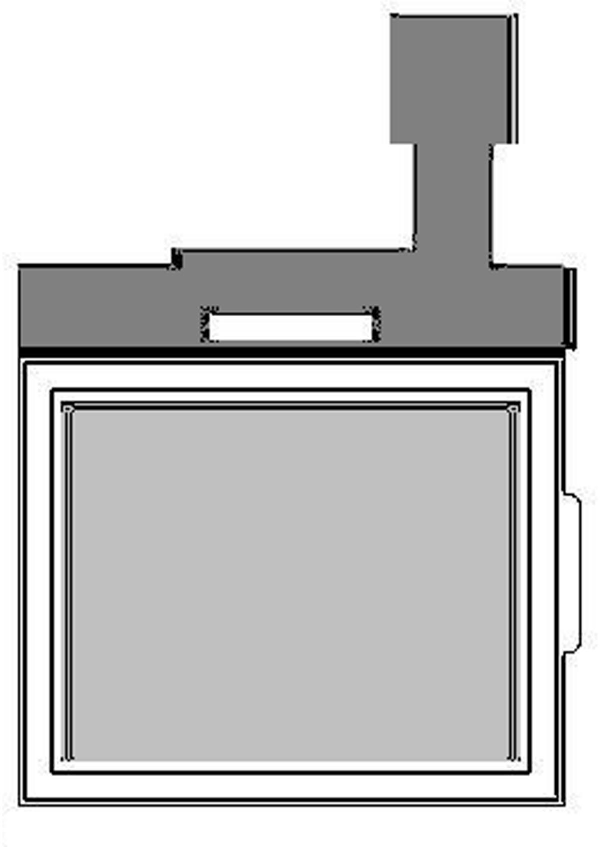


Figure 58 Cover display LCD module

Display features:

- Module size (width x height x thickness): 26.0 mm x 26.0 mm x 2.6 mm.
- 96x68 FSTN, 2 colors black & white with blue LEDs.
- Transflective, normally black, inverted.
- Partial display function; power saving by pausing display process on part of the screen.
- 68 x 96 bits RAM.

The display module does not require any tunings in service.

Keyboard

The device keyboard consists of 24 separate keys.

The keyboard is implemented as a matrix keyboard, which is connected directly to the dedicated keyboard GENIO lines. The power-on key is the same key as the "END" key (when pressed longer -> power OFF or ON).

The keymatrix has six rows and four columns.

Backlights

The main display has two white LEDs and the secondary display has two blue LEDs for display backlight inside of the display module. Voltage source for backlights is implemented using a white LED driver on the lower block, which is also used for keyboard backlight.

There is NPN digital transistor which controls which display is lighted at the time. The transistor is controlled by GENIO03. There is no possibility to turn both display backlights on in the same time.

The driver increases battery voltage up to 18V.

There are four LEDs in two series for keyboard backlight.

ASICs

RAP ASIC

RAP is a GSM EDGE chip (modem ASIC) with lots of peripheral features:

- processor subsystem (PSS) that includes ARM926 MCU as a main processor
- DSP and related functions
- ASIC clock and reset control
- MCU peripherals e.g. CBUS IF, USB IF and SIM IF
- DSP peripherals e.g. speech codec
- RF codec

EM ASIC (N2200)

EM ASIC (N2200) includes the following functional blocks:

- Start up logic and reset control
- Charger detection
- Battery voltage monitoring
- 32.768 kHz clock with external crystal
- Real time clock with external backup battery
- SIM card interface
- Stereo audio codecs and amplifiers
- A/D converter
- Regulators
- Vibra interface
- Digital interface (CBUS)

EM ASIC (N2300)

EM ASIC (N2300) is intended for energy management control, supply voltage generation and charge control of mobile phone.

Device memories

RAPGSM memories NOR flash and SDRAM

Modem memory consists of 128Mbit SDRAM and 256 Mbit NOR flash memory.

Audio concept

Audio HW architecture

The functional core of the audio hardware is built around two ASICs: RAPGSM engine ASIC and the mixed-signal ASIC Retu.

There are three audio transducers:

- 7x11 mm dynamic earpiece
- one 11x15 mm dynamic speaker
- electret microphone module

Note: The RM-198 can be assembled with or without the HAC (Hearing Aid Coil).

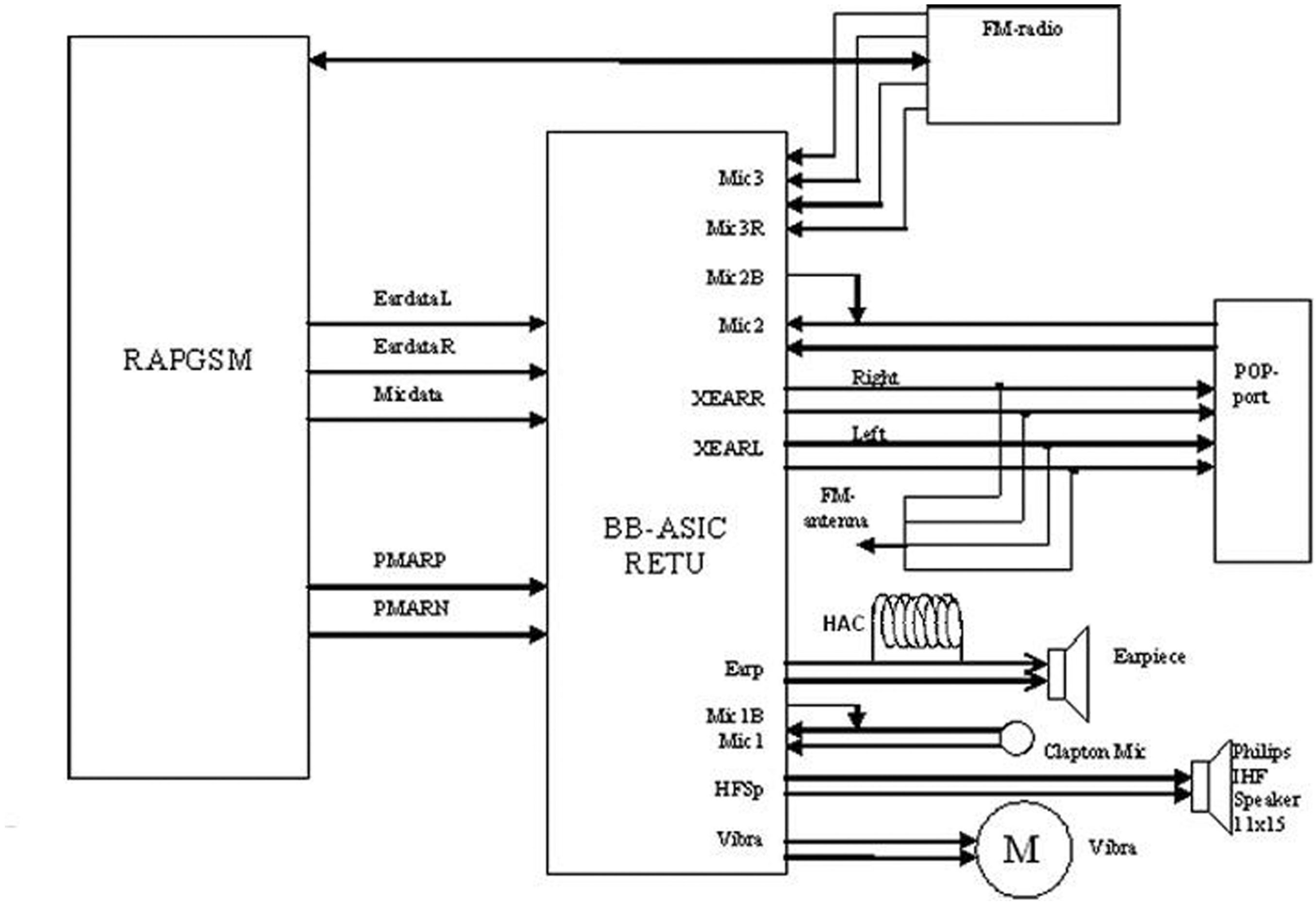

FM-radio
RAPGSM
EardataL
EardataR
Micdata
PMARP
PMARN
BB-ASIC
RETU
Mic3
Mic3R
Mic2B
Mic2
XEARR
XEARL
Right
Left
POP-
port
FM-
antenna
HAC
Earp
Earpiece
Mic1B
Mic1
Clapton Mic
HFSp
Philips
IHF
Speaker
11x15
Vibra
M
Vibra

Figure 59 Audio block diagram

Internal microphone

Internal microphone is used for HandPortable (HP) and Internal HandsFree (IHF) call modes.

An analogue electret microphone is connected to N2200 Mic1P and Mic1N inputs via asymmetric electrical connection.

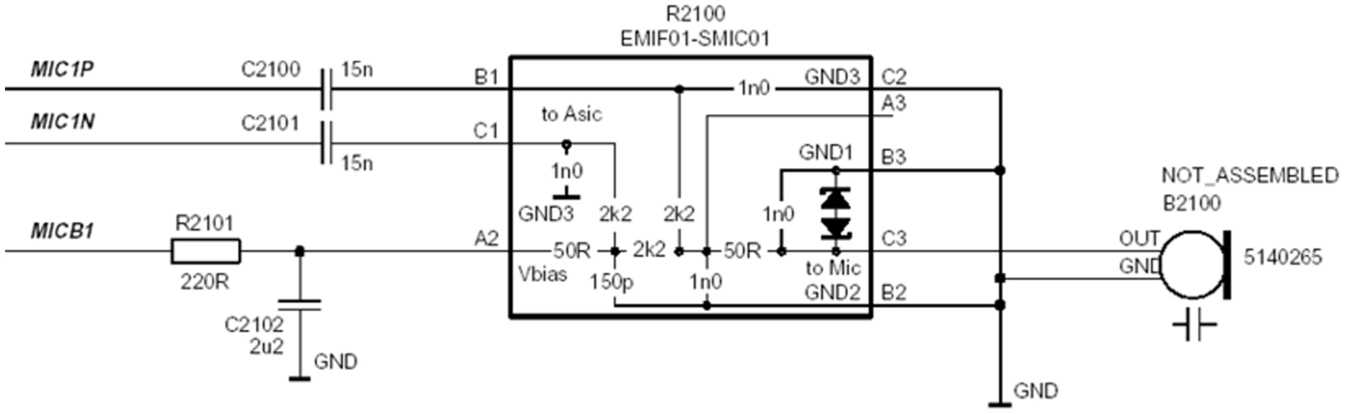

R2100
EMIF01-SMIC01
MIC1P
C2100
15n
MIC1N
C2101
15n
MICB1
R2101
220R
C2102
2u2
GND
B1
C1
A2
to Asic
1n0
GND3
2k2
2k2
50R
2k2
50R
Vbias
150p
1n0
1n0
GND3
GND1
to Mic
GND2
C2
A3
B3
C3
B2
GND
NOT_ASSEMBLED
B2100
OUT
GND
5140265

Figure 60 Internal microphone circuitry

External microphone

Galvanic accessories are connected to the system connector.

The accessory audio mode is automatically enabled/disabled during connection/disconnection of dedicated phone accessories.

Internal earpiece

Internal earpiece is used for the HandPortable (HP) call mode. A dynamic 8mm earpiece capsule is connected to EM ASIC’s (N2200) differential output EarP and EarN.

Note: The RM-198 can be assembled with or without the HAC (Hearing Aid Coil).

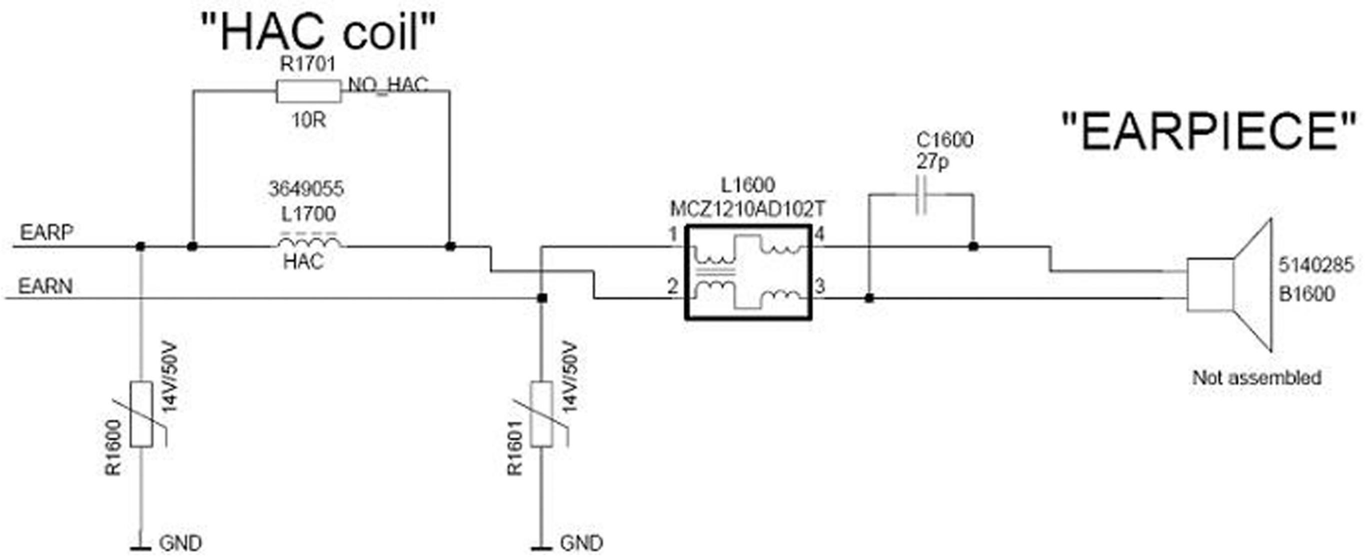

"HAC coil"
R1701
NO_HAC
10R
3649055
L1700
HAC
EARP
EARN
L1600
MCZ1210AD102T
1
2
3
4
C1600
27p
"EARPIECE"
5140285
B1600
Not assembled
R1600
14V/50V
R1601
14V/50V
GND
GND

Figure 61 Internal earpiece circuitry

Internal speakers

Internal speakers are used for Internal HandsFree (IHF) call mode, ringing tones, FM-radio and music listening.

The dynamic 11x15mm speaker is connected to Retu ASIC’s outputs HFSp P/N.

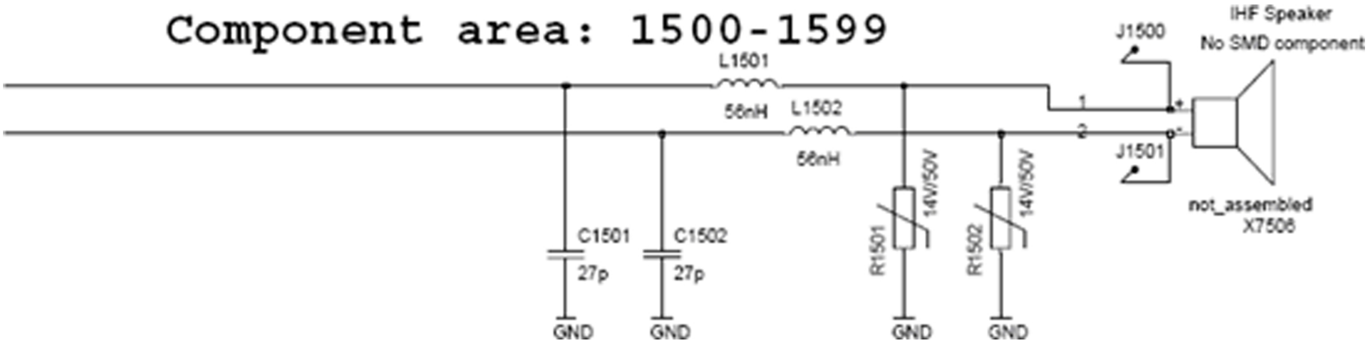

Component area: 1500-1599
L1501
56nH
L1502
56nH
J1500
J1501
IHF Speaker
No SMD component
not_assembled
X7506
1
2
C1501
27p
C1502
27p
R1501
14V/50V
R1502
14V/50V
GND
GND
GND
GND

Figure 62 Internal speaker circuitry

External earpiece

All galvanic accessories are connected to the system connector (Pop-Port™).

The accessory audio mode is automatically enabled/disabled during connection/disconnection of dedicated phone accessories.

Xear lines have 10 Ω series resistors in each line.

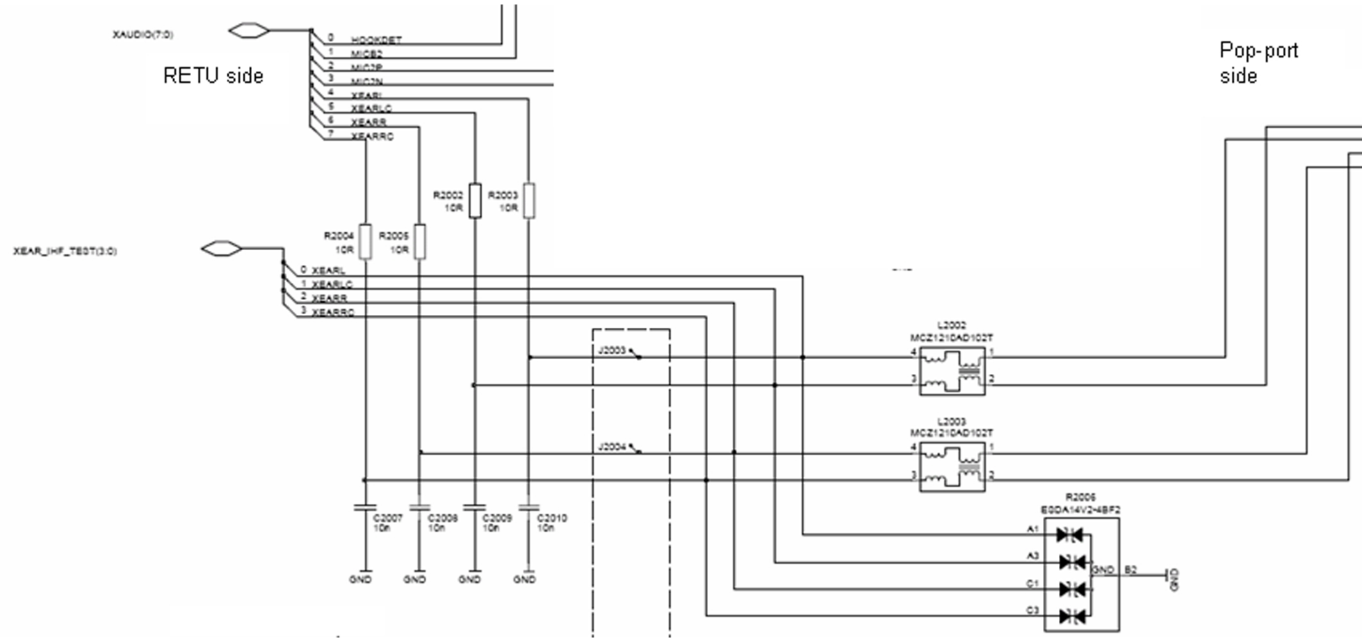

XAUDIO(7:0)
RETU side
0 HOOKDET
1 MICB2
2 MIC2P
3 MIC2N
4 XEARL
5 XEARLC
6 XEARR
7 XEARRC
R2002 10R
R2003 10R
R2004 10R
R2005 10R
XEAR_IHF_TEST(3:0)
0 XEARL
1 XEARLC
2 XEARR
3 XEARRC
J2003
J2004
C2007 10n
C2008 10n
C2009 10n
C2010 10n
GND
L2002 MCZ1210AD102T
L2003 MCZ1210AD102T
R2006 ESDA14V2-4BF2
A1
A3
C1
C3
GND
B2
Pop-port side

Figure 63 External earpiece circuitry (Pop-Port™ connected on the right)

Vibra circuitry

Vibra is used for vibra-alarm function.

A vibra lifter is used to connect the vibra to the main PWB. The vibra underlay is a simple PWB piece.

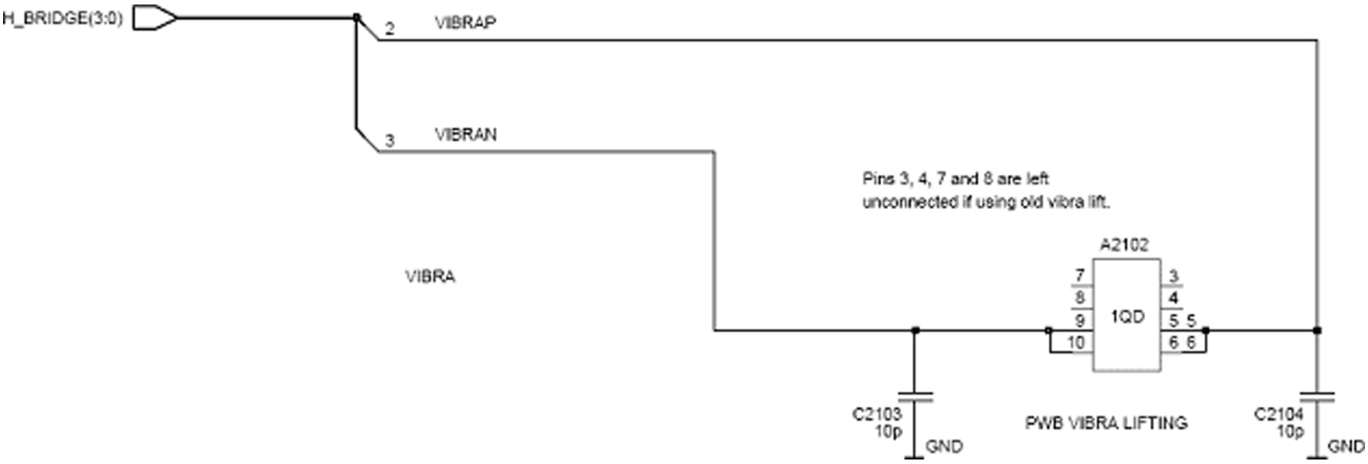

H_BRIDGE(3:0)
2 VIBRAP
3 VIBRAN
VIBRA
Pins 3, 4, 7 and 8 are left unconnected if using old vibra lift.
A2102
1QD
7
8
9
10
3
4
5 5
6 6
C2103 10p
GND
PWB VIBRA LIFTING
C2104 10p
GND

Figure 64 Vibra circuitry

Baseband technical specifications

External interfaces

Name of Connection	Connector reference
USB	X2000
Charger	X2002 and X2000
SIM	X2701
MicroSD	X3200
Battery connector	X2070

Name of Connection	Connector reference
SIM	X2701

Pop-port™ connector

Pop-Port™ connector provides a fully differential 4–wire stereo line-level output connection and fully differential 2-wire mono line-level or microphone level input connection.

The earpiece and headset signals are multiplexed so that the outputs cannot be used simultaneously.

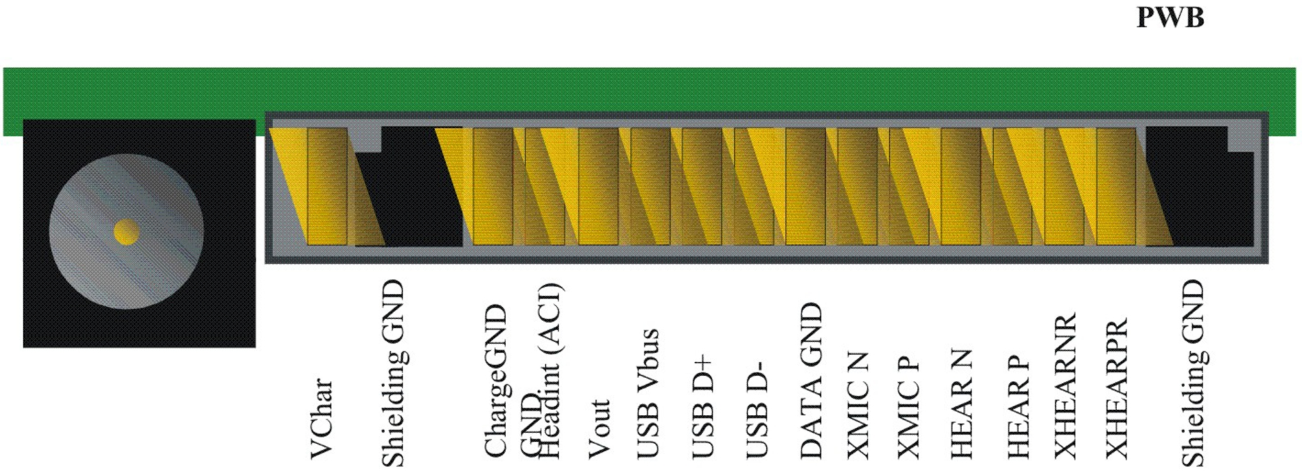

PWB
VChar
Shielding GND
ChargeGND
GND
Headint (ACI)
Vout
USB Vbus
USB D+
USB D-
DATA GND
XMIC N
XMIC P
HEAR N
HEAR P
XHEARNR
XHEARPR
Shielding GND

Figure 65 External audio connector

Table 14 Audio connector pin assignments

Pin #/ Signal name	Signal description	Spectral range	Voltage/ Current levels	Max or nominal serial impedance	Notes
1/ Charge	V Charge	DC	0-9V/ 0.85A		
2/ GND	Charge GND	-	0.85A	100mΩ (PWB+ conn.)	
3/ ACI	ACI	1kbits/s	Digital 0 / 2.5-2.78V	47Ω	Insertion & removal detection
4/ Vout	DC out	DC	2.78V 70 mA 2.5V 90mA	100mΩ (PWB+ conn.)	200mW
9 / XMIC N	Audio in	300-8k	1Vpp & 2.5-2.78VDC		
10 / XMIC P	Audio in	300-8k	1Vpp & 2.5-2.78VDC		
11 / HEAR N	Audio out	20-20k	1Vpp	22Ω	
12 / HEAR P	Audio out	20-20k	1Vpp	22Ω	
13 / HEAR R N	Audio out	20-20k	1Vpp	22Ω	Not conn. in mono

Pin #/ Signal name	Signal description	Spectral range	Voltage/ Current levels	Max or nominal serial impedance	Notes
14 / HEAR R P	Audio out	20-20k	1Vpp	22Ω	Not conn. in mono

VOUT electrical characteristics

Description	Parameter	Min	Max	Typical	Unit	Notes
Vout regulator for external accessories	VOUT	2.43	2.57	2.5	V	Max load 90mA

USB/FBUS connections and electrical characteristics

The USB operates in the low-power bus-mode only. The USB host provides VBUS voltage (5V, 100mA at maximum) to USB device.

Audio signal electrical characteristics

Description	Parameter	Typ	Unit	Notes
XMIC N	Audio in	1	V_{pp}	DC Offset 2.5-2.78V
XMIC P	Audio in	1	V_{pp}	DC Offset 2.5-2.78V
HSEAR N	Audio out	1	V_{pp}	22Ω nominal serial impedance
HSEAR P	Audio out	1	V_{pp}	22Ω nominal serial impedance
HSEAR R N	Audio out	1	V_{pp}	22Ω nominal serial impedance Not connected in mono
HSEAR R P	Audio out	1	V_{pp}	22Ω nominal serial impedance Not connected in mono

Charger connector and charging interface connections & electrical characteristics

Table 15 Charging interface connections

Pin	Signal	I/O	Engine connection		Notes
1	Vchar	In	EM ASIC (N2300)	VCharIn1, 2	Charging voltage / charger detection, Center pin
2	Charge GND		Ground		Charger ground

Table 16 Charging IF electrical characteristics

Description	Parameter	Min	Max	Unit	Notes
Vchar	V Charge	0	16	V	Center pin
Vchar	I Charge		0.95	A	Center pin
Charge GND			0.85	A	

Battery connector and interface connections & electrical characteristics

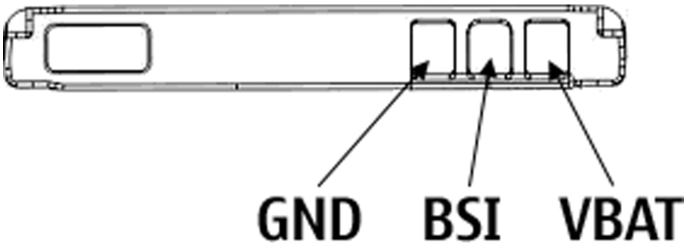


Figure 66 Battery connector

Table 17 Battery interface connections

Pin	Signal	I/O	Engine connection		Notes
1	VBAT	->	EM ASIC N2200	VBAT	Battery voltage
2	BSI	->	EM ASIC N2200	BSI	Battery size indication (fixed resistor inside the battery pack)
3	GND		GND		Ground

Table 18 Battery IF electrical characteristics

Description	Parameter	Max	Unit
Operation voltage	V_{IN}	4.23	VDC

Description	Parameter	Max	Unit
Current rating	I_{IN}	0.9	A

Internal interfaces

Name of Connection	Connector reference	Notes
UI connector	X2400 X1000	Lower block Upper block
Display Suez	X1100	Upper block
Display Naxos	X1101	Upper block
Camera	X1470	Upper block (through hole socket)
Vibra	A2102	Lower block
Microphone	B2100	Lower block
Earpiece	B1200	Upper block
IHF speaker	X7506	Upper block

Upper block connectors

Pin number, connector X1000	Destination	Test point	Name of the line/signal	NOTES
2	Earpiece, B1200	J1002	EARN	
3	Earpiece, B1200	J1003	EARP	
4	IHF	J1012	HFSPP	
5	IHF	J1013	HFSPN	
26	Camera, X1470	J1021	CAMCLK	Clk 9.6MHz
32	V1103	J1029	LED_SWITCH	Displays backlight switch
33	Camera, X1470 HWA, D1470	J1023	CAM_ENABLE, shutdown	Camera enable
35	Main display, X1100	J1026	LCDTE secondary display	
37	Camera, X1470 HWA, D1470	J1028	CAM_VCTRL	Camera power enable
38	Camera, X1470 HWA, D1470	J1025	Serial CLK CCI	I2C

Pin number, connector X1000	Destination	Test point	Name of the line/signal	NOTES
39	Camera, X1470	J1024	Serial Data CCI	I2C
	HWA, D1470			
46	LED driver, D1300	J1011	PWM300	

Back-up battery interface connections and electrical characteristics

Table 19 Back-up battery connections

Pin name	I/O	Connection	Notes
VBack	->	N2200, VBack	

Table 20 Back-up battery electrical characteristics

Description	Parameter	Min	Typ	Max	Unit
Back-Up Battery Voltage	Vback	0	2.5	2.7	V

RF description

Introduction to receiver functionality

Receiver functions are implemented in RF ASIC N7505.

The receiver is a linear direct conversion receiver consisting of separate front ends (LNA (Low Noise Amplifier) and demodulator) for each supported system. After the demodulators, the signal paths are combined to one common BB path.

GSM receiver

As GSM850, GSM900, GSM1800, GSM1900 Rx branches are functionally identical, the following description is applicable to all of them.

The received signal goes from the GSM antenna to the front end module (FEM) which includes switches from band selection. FEM is followed by dedicated SAW filters which are dual packaged so that one holds SAWs for 850 and 900 and the other for 1800 and 1900 bands. The SAW filters are followed by integrated LNAs residing in N7505.

The LNAs are followed by demodulators which downconvert the signal to baseband I and Q signals.

The channel select filter is set to 115 kHz in the GSM mode.

Introduction to transmitter functionality

Transmitter functions are implemented in the RF ASIC N7505. The ASIC contains a BB frequency low pass filter, which is tunable according to the signal bandwidth of the system in use.

GSM transmitter

N7505 receives an analogue IQ modulated signal from digital BB, which is first low pass filtered with filter corner frequency set to approximately 200 kHz. After the filter, the signal is routed to the GSM modulator. The amplifier gives 40 dB of power control dynamic range.

The appropriate routing after the modulator is selected by biasing either EGSM900 (/GSM850) or GSM1800/1900 variable gain amplifier. The amplifier gives 40 dB of power control dynamic range.

After the VGA stage the signal exits N7505. In case of GSM1800/1900 the signal goes directly to the FEM thru a balun, which converts single ended signal into balanced signal needed to feed the FEM. In case of GSM850 and EGSM900 the PA module is preceded by a SAW filter.

TX SAW Z7503 is also dual packaged so that the correct band is selected with control voltage coming from N7505. SAW also performs the unbalanced to balanced signal transformation. After the filter, the signal is fed to FEM. Finally the signal is routed to the antenna.

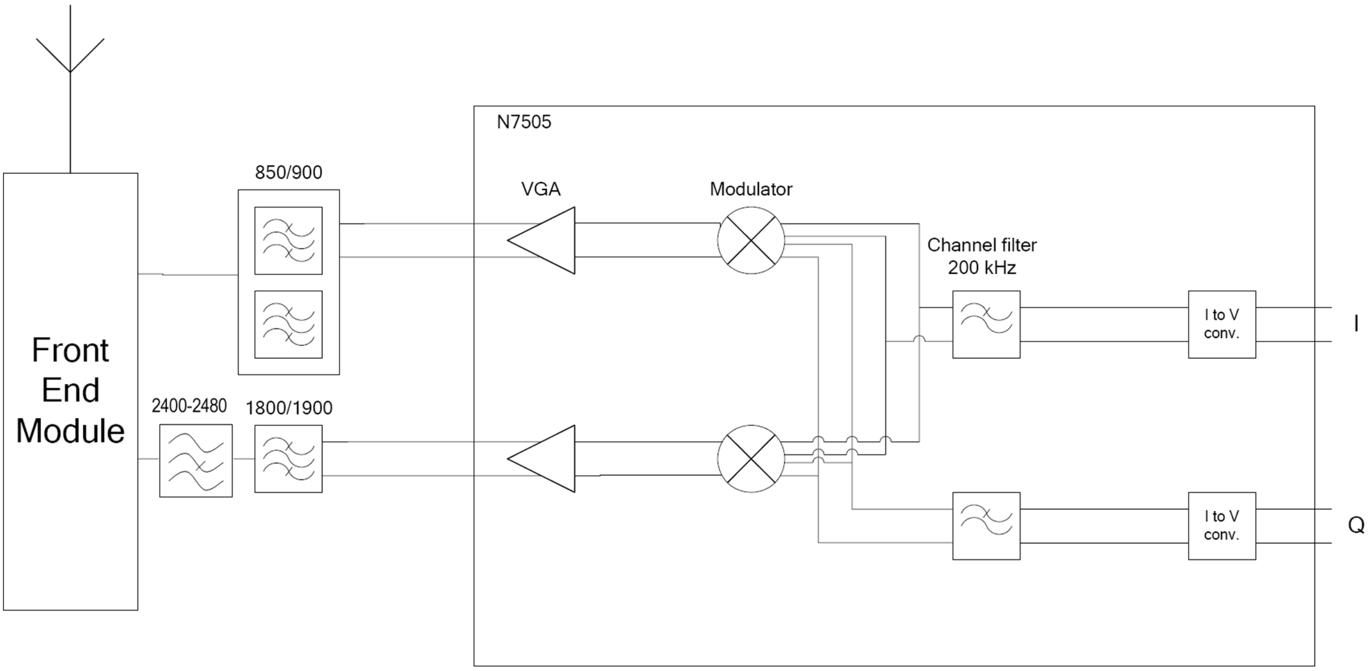


Figure 67 GSM transmitter

GSM power control

A closed control loop comprise an integrated power detector (in FEM) and an error amplifier. The error amplifier resides in N7505 and it controls the transmitter power of GSM.

GSM FEM (front end module)

A single GSM/EDGE FEM contains two separate amplifier chains, one for EGSM900 and GSM850 and another for GSM1800/1900.

Frequency synthesizers

RF ASIC N7505 has a single synthesizer that is used to generate right frequencies for both TX and RX.

Reference oscillators

A 38.4MHz VCTCXO is used as a reference oscillator for the frequency synthesizers.

Regulators

N7505 contains integrated regulators to supply regulated voltages for their internal circuitry and other RF parts.

Frequency mappings

GSM850 frequencies

CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX
128	824.2	869.2	3296.8	3476.8	170	832.6	877.6	3330.4	3510.4	212	841.0	886.0	3364.0	3544.0
129	824.4	869.4	3297.6	3477.6	171	832.8	877.8	3331.2	3511.2	213	841.2	886.2	3364.8	3544.8
130	824.6	869.6	3298.4	3478.4	172	833.0	878.0	3332.0	3512.0	214	841.4	886.4	3365.6	3545.6
131	824.8	869.8	3299.2	3479.2	173	833.2	878.2	3332.8	3512.8	215	841.6	886.6	3366.4	3546.4
132	825.0	870.0	3300.0	3480.0	174	833.4	878.4	3333.6	3513.6	216	841.8	886.8	3367.2	3547.2
133	825.2	870.2	3300.8	3480.8	175	833.6	878.6	3334.4	3514.4	217	842.0	887.0	3368.0	3548.0
134	825.4	870.4	3301.6	3481.6	176	833.8	878.8	3335.2	3515.2	218	842.2	887.2	3368.8	3548.8
135	825.6	870.6	3302.4	3482.4	177	834.0	879.0	3336.0	3516.0	219	842.4	887.4	3369.6	3549.6
136	825.8	870.8	3303.2	3483.2	178	834.2	879.2	3336.8	3516.8	220	842.6	887.6	3370.4	3550.4
137	826.0	871.0	3304.0	3484.0	179	834.4	879.4	3337.6	3517.6	221	842.8	887.8	3371.2	3551.2
138	826.2	871.2	3304.8	3484.8	180	834.6	879.6	3338.4	3518.4	222	843.0	888.0	3372.0	3552.0
139	826.4	871.4	3305.6	3485.6	181	834.8	879.8	3339.2	3519.2	223	843.2	888.2	3372.8	3552.8
140	826.6	871.6	3306.4	3486.4	182	835.0	880.0	3340.0	3520.0	224	843.4	888.4	3373.6	3553.6
141	826.8	871.8	3307.2	3487.2	183	835.2	880.2	3340.8	3520.8	225	843.6	888.6	3374.4	3554.4
142	827.0	872.0	3308.0	3488.0	184	835.4	880.4	3341.6	3521.6	226	843.8	888.8	3375.2	3555.2
143	827.2	872.2	3308.8	3488.8	185	835.6	880.6	3342.4	3522.4	227	844.0	889.0	3376.0	3556.0
144	827.4	872.4	3309.6	3489.6	186	835.8	880.8	3343.2	3523.2	228	844.2	889.2	3376.8	3556.8
145	827.6	872.6	3310.4	3490.4	187	836.0	881.0	3344.0	3524.0	229	844.4	889.4	3377.6	3557.6
146	827.8	872.8	3311.2	3491.2	188	836.2	881.2	3344.8	3524.8	230	844.6	889.6	3378.4	3558.4
147	828.0	873.0	3312.0	3492.0	189	836.4	881.4	3345.6	3525.6	231	844.8	889.8	3379.2	3559.2
148	828.2	873.2	3312.8	3492.8	190	836.6	881.6	3346.4	3526.4	232	845.0	890.0	3380.0	3560.0
149	828.4	873.4	3313.6	3493.6	191	836.8	881.8	3347.2	3527.2	233	845.2	890.2	3380.8	3560.8
150	828.6	873.6	3314.4	3494.4	192	837.0	882.0	3348.0	3528.0	234	845.4	890.4	3381.6	3561.6
151	828.8	873.8	3315.2	3495.2	193	837.2	882.2	3348.8	3528.8	235	845.6	890.6	3382.4	3562.4
152	829.0	874.0	3316.0	3496.0	194	837.4	882.4	3349.6	3529.6	236	845.8	890.8	3383.2	3563.2
153	829.2	874.2	3316.8	3496.8	195	837.6	882.6	3350.4	3530.4	237	846.0	891.0	3384.0	3564.0
154	829.4	874.4	3317.6	3497.6	196	837.8	882.8	3351.2	3531.2	238	846.2	891.2	3384.8	3564.8
155	829.6	874.6	3318.4	3498.4	197	838.0	883.0	3352.0	3532.0	239	846.4	891.4	3385.6	3565.6
156	829.8	874.8	3319.2	3499.2	198	838.2	883.2	3352.8	3532.8	240	846.6	891.6	3386.4	3566.4
157	830.0	875.0	3320.0	3500.0	199	838.4	883.4	3353.6	3533.6	241	846.8	891.8	3387.2	3567.2
158	830.2	875.2	3320.8	3500.8	200	838.6	883.6	3354.4	3534.4	242	847.0	892.0	3388.0	3568.0
159	830.4	875.4	3321.6	3501.6	201	838.8	883.8	3355.2	3535.2	243	847.2	892.2	3388.8	3568.8
160	830.6	875.6	3322.4	3502.4	202	839.0	884.0	3356.0	3536.0	244	847.4	892.4	3389.6	3569.6
161	830.8	875.8	3323.2	3503.2	203	839.2	884.2	3356.8	3536.8	245	847.6	892.6	3390.4	3570.4
162	831.0	876.0	3324.0	3504.0	204	839.4	884.4	3357.6	3537.6	246	847.8	892.8	3391.2	3571.2
163	831.2	876.2	3324.8	3504.8	205	839.6	884.6	3358.4	3538.4	247	848.0	893.0	3392.0	3572.0
164	831.4	876.4	3325.6	3505.6	206	839.8	884.8	3359.2	3539.2	248	848.2	893.2	3392.8	3572.8
165	831.6	876.6	3326.4	3506.4	207	840.0	885.0	3360.0	3540.0	249	848.4	893.4	3393.6	3573.6
166	831.8	876.8	3327.2	3507.2	208	840.2	885.2	3360.8	3540.8	250	848.6	893.6	3394.4	3574.4
167	832.0	877.0	3328.0	3508.0	209	840.4	885.4	3361.6	3541.6	251	848.8	893.8	3395.2	3575.2

EGSM900 frequencies

CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX
975	880,2	925,2	3520,8	3700,8	1	890,2	935,2	3560,8	3740,8	63	902,6	947,6	3610,4	3790,4
976	880,4	925,4	3521,6	3701,6	2	890,4	935,4	3561,6	3741,6	64	902,8	947,8	3611,2	3791,2
977	880,6	925,6	3522,4	3702,4	3	890,6	935,6	3562,4	3742,4	65	903,0	948,0	3612,0	3792,0
978	880,8	925,8	3523,2	3703,2	4	890,8	935,8	3563,2	3743,2	66	903,2	948,2	3612,8	3792,8
979	881,0	926,0	3524,0	3704,0	5	891,0	936,0	3564,0	3744,0	67	903,4	948,4	3613,6	3793,6
980	881,2	926,2	3524,8	3704,8	6	891,2	936,2	3564,8	3744,8	68	903,6	948,6	3614,4	3794,4
981	881,4	926,4	3525,6	3705,6	7	891,4	936,4	3565,6	3745,6	69	903,8	948,8	3615,2	3795,2
982	881,6	926,6	3526,4	3706,4	8	891,6	936,6	3566,4	3746,4	70	904,0	949,0	3616,0	3796,0
983	881,8	926,8	3527,2	3707,2	9	891,8	936,8	3567,2	3747,2	71	904,2	949,2	3616,8	3796,8
984	882,0	927,0	3528,0	3708,0	10	892,0	937,0	3568,0	3748,0	72	904,4	949,4	3617,6	3797,6
985	882,2	927,2	3528,8	3708,8	11	892,2	937,2	3568,8	3748,8	73	904,6	949,6	3618,4	3798,4
986	882,4	927,4	3529,6	3709,6	12	892,4	937,4	3569,6	3749,6	74	904,8	949,8	3619,2	3799,2
987	882,6	927,6	3530,4	3710,4	13	892,6	937,6	3570,4	3750,4	75	905,0	950,0	3620,0	3800,0
988	882,8	927,8	3531,2	3711,2	14	892,8	937,8	3571,2	3751,2	76	905,2	950,2	3620,8	3800,8
989	883,0	928,0	3532,0	3712,0	15	893,0	938,0	3572,0	3752,0	77	905,4	950,4	3621,6	3801,6
990	883,2	928,2	3532,8	3712,8	16	893,2	938,2	3572,8	3752,8	78	905,6	950,6	3622,4	3802,4
991	883,4	928,4	3533,6	3713,6	17	893,4	938,4	3573,6	3753,6	79	905,8	950,8	3623,2	3803,2
992	883,6	928,6	3534,4	3714,4	18	893,6	938,6	3574,4	3754,4	80	906,0	951,0	3624,0	3804,0
993	883,8	928,8	3535,2	3715,2	19	893,8	938,8	3575,2	3755,2	81	906,2	951,2	3624,8	3804,8
994	884,0	929,0	3536,0	3716,0	20	894,0	939,0	3576,0	3756,0	82	906,4	951,4	3625,6	3805,6
995	884,2	929,2	3536,8	3716,8	21	894,2	939,2	3576,8	3756,8	83	906,6	951,6	3626,4	3806,4
996	884,4	929,4	3537,6	3717,6	22	894,4	939,4	3577,6	3757,6	84	906,8	951,8	3627,2	3807,2
997	884,6	929,6	3538,4	3718,4	23	894,6	939,6	3578,4	3758,4	85	907,0	952,0	3628,0	3808,0
998	884,8	929,8	3539,2	3719,2	24	894,8	939,8	3579,2	3759,2	86	907,2	952,2	3628,8	3808,8
999	885,0	930,0	3540,0	3720,0	25	895,0	940,0	3580,0	3760,0	87	907,4	952,4	3629,6	3809,6
1000	885,2	930,2	3540,8	3720,8	26	895,2	940,2	3580,8	3760,8	88	907,6	952,6	3630,4	3810,4
1001	885,4	930,4	3541,6	3721,6	27	895,4	940,4	3581,6	3761,6	89	907,8	952,8	3631,2	3811,2
1002	885,6	930,6	3542,4	3722,4	28	895,6	940,6	3582,4	3762,4	90	908,0	953,0	3632,0	3812,0
1003	885,8	930,8	3543,2	3723,2	29	895,8	940,8	3583,2	3763,2	91	908,2	953,2	3632,8	3812,8
1004	886,0	931,0	3544,0	3724,0	30	896,0	941,0	3584,0	3764,0	92	908,4	953,4	3633,6	3813,6
1005	886,2	931,2	3544,8	3724,8	31	896,2	941,2	3584,8	3764,8	93	908,6	953,6	3634,4	3814,4
1006	886,4	931,4	3545,6	3725,6	32	896,4	941,4	3585,6	3765,6	94	908,8	953,8	3635,2	3815,2
1007	886,6	931,6	3546,4	3726,4	33	896,6	941,6	3586,4	3766,4	95	909,0	954,0	3636,0	3816,0
1008	886,8	931,8	3547,2	3727,2	34	896,8	941,8	3587,2	3767,2	96	909,2	954,2	3636,8	3816,8
1009	887,0	932,0	3548,0	3728,0	35	897,0	942,0	3588,0	3768,0	97	909,4	954,4	3637,6	3817,6
1010	887,2	932,2	3548,8	3728,8	36	897,2	942,2	3588,8	3768,8	98	909,6	954,6	3638,4	3818,4
1011	887,4	932,4	3549,6	3729,6	37	897,4	942,4	3589,6	3769,6	99	909,8	954,8	3639,2	3819,2
1012	887,6	932,6	3550,4	3730,4	38	897,6	942,6	3590,4	3770,4	100	910,0	955,0	3640,0	3820,0
1013	887,8	932,8	3551,2	3731,2	39	897,8	942,8	3591,2	3771,2	101	910,2	955,2	3640,8	3820,8
1014	888,0	933,0	3552,0	3732,0	40	898,0	943,0	3592,0	3772,0	102	910,4	955,4	3641,6	3821,6
1015	888,2	933,2	3552,8	3732,8	41	898,2	943,2	3592,8	3772,8	103	910,6	955,6	3642,4	3822,4
1016	888,4	933,4	3553,6	3733,6	42	898,4	943,4	3593,6	3773,6	104	910,8	955,8	3643,2	3823,2
1017	888,6	933,6	3554,4	3734,4	43	898,6	943,6	3594,4	3774,4	105	911,0	956,0	3644,0	3824,0
1018	888,8	933,8	3555,2	3735,2	44	898,8	943,8	3595,2	3775,2	106	911,2	956,2	3644,8	3824,8
1019	889,0	934,0	3556,0	3736,0	45	899,0	944,0	3596,0	3776,0	107	911,4	956,4	3645,6	3825,6
1020	889,2	934,2	3556,8	3736,8	46	899,2	944,2	3596,8	3776,8	108	911,6	956,6	3646,4	3826,4
1021	889,4	934,4	3557,6	3737,6	47	899,4	944,4	3597,6	3777,6	109	911,8	956,8	3647,2	3827,2
1022	889,6	934,6	3558,4	3738,4	48	899,6	944,6	3598,4	3778,4	110	912,0	957,0	3648,0	3828,0
1023	889,8	934,8	3559,2	3739,2	49	899,8	944,8	3599,2	3779,2	111	912,2	957,2	3648,8	3828,8
0	890,0	935,0	3560,0	3740,0	50	900,0	945,0	3600,0	3780,0	112	912,4	957,4	3649,6	3829,6
					51	900,2	945,2	3600,8	3780,8	113	912,6	957,6	3650,4	3830,4
					52	900,4	945,4	3601,6	3781,6	114	912,8	957,8	3651,2	3831,2
					53	900,6	945,6	3602,4	3782,4	115	913,0	958,0	3652,0	3832,0
					54	900,8	945,8	3603,2	3783,2	116	913,2	958,2	3652,8	3832,8
					55	901,0	946,0	3604,0	3784,0	117	913,4	958,4	3653,6	3833,6
					56	901,2	946,2	3604,8	3784,8	118	913,6	958,6	3654,4	3834,4
					57	901,4	946,4	3605,6	3785,6	119	913,8	958,8	3655,2	3835,2
					58	901,6	946,6	3606,4	3786,4	120	914,0	959,0	3656,0	3836,0
					59	901,8	946,8	3607,2	3787,2	121	914,2	959,2	3656,8	3836,8
					60	902,0	947,0	3608,0	3788,0	122	914,4	959,4	3657,6	3837,6
					61	902,2	947,2	3608,8	3788,8	123	914,6	959,6	3658,4	3838,4
					62	902,4	947,4	3609,6	3789,6	124	914,8	959,8	3659,2	3839,2

GSM1800 frequencies

Ch	Tx	Rx	VCO Tx	VCO Rx	Ch	Tx	Rx	VCO Tx	VCO Rx	Ch	Tx	Rx	VCO Tx	VCO Rx	Ch	Tx	Rx	VCO Tx	VCO Rx
512	1710.2	1805.2	3420.4	3610.4	606	1729.0	1824.0	3458.0	3648.0	700	1747.8	1842.8	3495.6	3685.6	793	1766.4	1861.4	3532.8	3722.8
513	1710.4	1805.4	3420.8	3610.8	607	1729.2	1824.2	3458.4	3648.4	701	1748.0	1843.0	3496.0	3686.0	794	1766.6	1861.6	3533.2	3723.2
514	1710.6	1805.6	3421.2	3611.2	608	1729.4	1824.4	3458.8	3648.8	702	1748.2	1843.2	3496.4	3686.4	795	1766.8	1861.8	3533.6	3723.6
515	1710.8	1805.8	3421.6	3611.6	609	1729.6	1824.6	3459.2	3649.2	703	1748.4	1843.4	3496.8	3686.8	796	1767.0	1862.0	3534.0	3724.0
516	1711.0	1806.0	3422.0	3612.0	610	1729.8	1824.8	3459.6	3649.6	704	1748.6	1843.6	3497.2	3687.2	797	1767.2	1862.2	3534.4	3724.4
517	1711.2	1806.2	3422.4	3612.4	611	1730.0	1825.0	3460.0	3650.0	705	1748.8	1843.8	3497.6	3687.6	798	1767.4	1862.4	3534.8	3724.8
518	1711.4	1806.4	3422.8	3612.8	612	1730.2	1825.2	3460.4	3650.4	706	1749.0	1844.0	3498.0	3688.0	799	1767.6	1862.6	3535.2	3725.2
519	1711.6	1806.6	3423.2	3613.2	613	1730.4	1825.4	3460.8	3650.8	707	1749.2	1844.2	3498.4	3688.4	800	1767.8	1862.8	3535.6	3725.6
520	1711.8	1806.8	3423.6	3613.6	614	1730.6	1825.6	3461.2	3651.2	708	1749.4	1844.4	3498.8	3688.8	801	1768.0	1863.0	3536.0	3726.0
521	1712.0	1807.0	3424.0	3614.0	615	1730.8	1825.8	3461.6	3651.6	709	1749.6	1844.6	3499.2	3689.2	802	1768.2	1863.2	3536.4	3726.4
522	1712.2	1807.2	3424.4	3614.4	616	1731.0	1826.0	3462.0	3652.0	710	1749.8	1844.8	3499.6	3689.6	803	1768.4	1863.4	3536.8	3726.8
523	1712.4	1807.4	3424.8	3614.8	617	1731.2	1826.2	3462.4	3652.4	711	1750.0	1845.0	3500.0	3690.0	804	1768.6	1863.6	3537.2	3727.2
524	1712.6	1807.6	3425.2	3615.2	618	1731.4	1826.4	3462.8	3652.8	712	1750.2	1845.2	3500.4	3690.4	805	1768.8	1863.8	3537.6	3727.6
525	1712.8	1807.8	3425.6	3615.6	619	1731.6	1826.6	3463.2	3653.2	713	1750.4	1845.4	3500.8	3690.8	806	1769.0	1864.0	3538.0	3728.0
526	1713.0	1808.0	3426.0	3616.0	620	1731.8	1826.8	3463.6	3653.6	714	1750.6	1845.6	3501.2	3691.2	807	1769.2	1864.2	3538.4	3728.4
527	1713.2	1808.2	3426.4	3616.4	621	1732.0	1827.0	3464.0	3654.0	715	1750.8	1845.8	3501.6	3691.6	808	1769.4	1864.4	3538.8	3728.8
528	1713.4	1808.4	3426.8	3616.8	622	1732.2	1827.2	3464.4	3654.4	716	1751.0	1846.0	3502.0	3692.0	809	1769.6	1864.6	3539.2	3729.2
529	1713.6	1808.6	3427.2	3617.2	623	1732.4	1827.4	3464.8	3654.8	717	1751.2	1846.2	3502.4	3692.4	810	1769.8	1864.8	3539.6	3729.6
530	1713.8	1808.8	3427.6	3617.6	624	1732.6	1827.6	3465.2	3655.2	718	1751.4	1846.4	3502.8	3692.8	811	1770.0	1865.0	3540.0	3730.0
531	1714.0	1809.0	3428.0	3618.0	625	1732.8	1827.8	3465.6	3655.6	719	1751.6	1846.6	3503.2	3693.2	812	1770.2	1865.2	3540.4	3730.4
532	1714.2	1809.2	3428.4	3618.4	626	1733.0	1828.0	3466.0	3656.0	720	1751.8	1846.8	3503.6	3693.6	813	1770.4	1865.4	3540.8	3730.8
533	1714.4	1809.4	3428.8	3618.8	627	1733.2	1828.2	3466.4	3656.4	721	1752.0	1847.0	3504.0	3694.0	814	1770.6	1865.6	3541.2	3731.2
534	1714.6	1809.6	3429.2	3619.2	628	1733.4	1828.4	3466.8	3656.8	722	1752.2	1847.2	3504.4	3694.4	815	1770.8	1865.8	3541.6	3731.6
535	1714.8	1809.8	3429.6	3619.6	629	1733.6	1828.6	3467.2	3657.2	723	1752.4	1847.4	3504.8	3694.8	816	1771.0	1866.0	3542.0	3732.0
536	1715.0	1810.0	3430.0	3620.0	630	1733.8	1828.8	3467.6	3657.6	724	1752.6	1847.6	3505.2	3695.2	817	1771.2	1866.2	3542.4	3732.4
537	1715.2	1810.2	3430.4	3620.4	631	1734.0	1829.0	3468.0	3658.0	725	1752.8	1847.8	3505.6	3695.6	818	1771.4	1866.4	3542.8	3732.8
538	1715.4	1810.4	3430.8	3620.8	632	1734.2	1829.2	3468.4	3658.4	726	1753.0	1848.0	3506.0	3696.0	819	1771.6	1866.6	3543.2	3733.2
539	1715.6	1810.6	3431.2	3621.2	633	1734.4	1829.4	3468.8	3658.8	727	1753.2	1848.2	3506.4	3696.4	820	1771.8	1866.8	3543.6	3733.6
540	1715.8	1810.8	3431.6	3621.6	634	1734.6	1829.6	3469.2	3659.2	728	1753.4	1848.4	3506.8	3696.8	821	1772.0	1867.0	3544.0	3734.0
541	1716.0	1811.0	3432.0	3622.0	635	1734.8	1829.8	3469.6	3659.6	729	1753.6	1848.6	3507.2	3697.2	822	1772.2	1867.2	3544.4	3734.4
542	1716.2	1811.2	3432.4	3622.4	636	1735.0	1830.0	3470.0	3660.0	730	1753.8	1848.8	3507.6	3697.6	823	1772.4	1867.4	3544.8	3734.8
543	1716.4	1811.4	3432.8	3622.8	637	1735.2	1830.2	3470.4	3660.4	731	1754.0	1849.0	3508.0	3698.0	824	1772.6	1867.6	3545.2	3735.2
544	1716.6	1811.6	3433.2	3623.2	638	1735.4	1830.4	3470.8	3660.8	732	1754.2	1849.2	3508.4	3698.4	825	1772.8	1867.8	3545.6	3735.6
545	1716.8	1811.8	3433.6	3623.6	639	1735.6	1830.6	3471.2	3661.2	733	1754.4	1849.4	3508.8	3698.8	826	1773.0	1868.0	3546.0	3736.0
546	1717.0	1812.0	3434.0	3624.0	640	1735.8	1830.8	3471.6	3661.6	734	1754.6	1849.6	3509.2	3699.2	827	1773.2	1868.2	3546.4	3736.4
547	1717.2	1812.2	3434.4	3624.4	641	1736.0	1831.0	3472.0	3662.0	735	1754.8	1849.8	3509.6	3699.6	828	1773.4	1868.4	3546.8	3736.8
548	1717.4	1812.4	3434.8	3624.8	642	1736.2	1831.2	3472.4	3662.4	736	1755.0	1850.0	3510.0	3700.0	829	1773.6	1868.6	3547.2	3737.2
549	1717.6	1812.6	3435.2	3625.2	643	1736.4	1831.4	3472.8	3662.8	737	1755.2	1850.2	3510.4	3700.4	830	1773.8	1868.8	3547.6	3737.6
550	1717.8	1812.8	3435.6	3625.6	644	1736.6	1831.6	3473.2	3663.2	738	1755.4	1850.4	3510.8	3700.8	831	1774.0	1869.0	3548.0	3738.0
551	1718.0	1813.0	3436.0	3626.0	645	1736.8	1831.8	3473.6	3663.6	739	1755.6	1850.6	3511.2	3701.2	832	1774.2	1869.2	3548.4	3738.4
552	1718.2	1813.2	3436.4	3626.4	646	1737.0	1832.0	3474.0	3664.0	740	1755.8	1850.8	3511.6	3701.6	833	1774.4	1869.4	3548.8	3738.8
553	1718.4	1813.4	3436.8	3626.8	647	1737.2	1832.2	3474.4	3664.4	741	1756.0	1851.0	3512.0	3702.0	834	1774.6	1869.6	3549.2	3739.2
554	1718.6	1813.6	3437.2	3627.2	648	1737.4	1832.4	3474.8	3664.8	742	1756.2	1851.2	3512.4	3702.4	835	1774.8	1869.8	3549.6	3739.6
555	1718.8	1813.8	3437.6	3627.6	649	1737.6	1832.6	3475.2	3665.2	743	1756.4	1851.4	3512.8	3702.8	836	1775.0	1870.0	3550.0	3740.0
556	1719.0	1814.0	3438.0	3628.0	650	1737.8	1832.8	3475.6	3665.6	744	1756.6	1851.6	3513.2	3703.2	837	1775.2	1870.2	3550.4	3740.4
557	1719.2	1814.2	3438.4	3628.4	651	1738.0	1833.0	3476.0	3666.0	745	1756.8	1851.8	3513.6	3703.6	838	1775.4	1870.4	3550.8	3740.8
558	1719.4	1814.4	3438.8	3628.8	652	1738.2	1833.2	3476.4	3666.4	746	1757.0	1852.0	3514.0	3704.0	839	1775.6	1870.6	3551.2	3741.2
559	1719.6	1814.6	3439.2	3629.2	653	1738.4	1833.4	3476.8	3666.8	747	1757.2	1852.2	3514.4	3704.4	840	1775.8	1870.8	3551.6	3741.6
560	1719.8	1814.8	3439.6	3629.6	654	1738.6	1833.6	3477.2	3667.2	748	1757.4	1852.4	3514.8	3704.8	841	1776.0	1871.0	3552.0	3742.0
561	1720.0	1815.0	3440.0	3630.0	655	1738.8	1833.8	3477.6	3667.6	749	1757.6	1852.6	3515.2	3705.2	842	1776.2	1871.2	3552.4	3742.4
562	1720.2	1815.2	3440.4	3630.4	656	1739.0	1834.0	3478.0	3668.0	750	1757.8	1852.8	3515.6	3705.6	843	1776.4	1871.4	3552.8	3742.8
563	1720.4	1815.4	3440.8	3630.8	657	1739.2	1834.2	3478.4	3668.4	751	1758.0	1853.0	3516.0	3706.0	844	1776.6	1871.6	3553.2	3743.2
564	1720.6	1815.6	3441.2	3631.2	658	1739.4	1834.4	3478.8	3668.8	752	1758.2	1853.2	3516.4	3706.4	845	1776.8	1871.8	3553.6	3743.6
565	1720.8	1815.8	3441.6	3631.6	659	1739.6	1834.6	3479.2	3669.2	753	1758.4	1853.4	3516.8	3706.8	846	1777.0	1872.0	3554.0	3744.0
566	1721.0	1816.0	3442.0	3632.0	660	1739.8	1834.8	3479.6	3669.6	754	1758.6	1853.6	3517.2	3707.2	847	1777.2	1872.2	3554.4	3744.4
567	1721.2	1816.2	3442.4	3632.4	661	1740.0	1835.0	3480.0	3670.0	755	1758.8	1853.8	3517.6	3707.6	848	1777.4	1872.4	3554.8	3744.8
568	1721.4	1816.4	3442.8	3632.8	662	1740.2	1835.2	3480.4	3670.4	756	1759.0	1854.0	3518.0	3708.0	849	1777.6	1872.6	3555.2	3745.2
569	1721.6	1816.6	3443.2	3633.2	663	1740.4	1835.4	3480.8	3670.8	757	1759.2	1854.2	3518.4	3708.4	850	1777.8	1872.8	3555.6	3745.6
570	1721.8	1816.8	3443.6	3633.6	664	1740.6	1835.6	3481.2	3671.2	758	1759.4	1854.4	3518.8	3708.8	851	1778.0	1873.0	3556.0	3746.0
571	1722.0	1817.0	3444.0	3634.0	665	1740.8	1835.8	3481.6	3671.6	759	1759.6	1854.6	3519.2	3709.2	852	1778.2	1873.2	3556.4	3746.4
572	1722.2	1817.2	3444.4	3634.4	666	1741.0	1836.0	3482.0	3672.0	760	1759.8	1854.8	3519.6	3709.6	853	1778.4	1873.4	3556.8	3746.8
573	1722.4	1817.4	3444.8	3634.8	667	1741.2	1836.2	3482.4	3672.4	761	1760.0	1855.0	3520.0	3710.0	854	1778.6	1873.6	3557.2	3747.2
574	1722.6	1817.6	3445.2	3635.2	668	1741.4	1836.4	3482.8	3672.8	762	1760.2	1855.2	3520.4	3710.4	855	1778.8	1873.8	3557.6	3747.6
575	1722.8	1817.8	3445.6	3635.6	669	1741.6	1836.6	3483.2	3673.2	763	1760.4	1855.4	3520.8	3710.8	856	1779.0	1874.0	3558.0	3748.0
576	1723.0	1818.0	3446.0	3636.0	670	1741.8	1836.8	3483.6	3673.6	764	1760.6	1855.6	3521.2	3711.2	857	1779.2	1874.2	3558.4	3748.4
577	1723.2	1818.2	3446.4	3636.4	671	1742.0	1837.0	3484.0	3674.0	765	1760.8	1855.8	3521.6	3711.6	858	1779.4	1874.4	3558.8	3748.8
578	1723.4	1818.4	3446.8	3636.8	672	1742.2	1837.2	3484.4	3674.4	766	1761.0	1856.0	3522.0	3712.0	859	1779.6	1874.6	3559.2	3749.2
579	1723.6	1818.6	3447.2	3637.2	673	1742.4	1837.4	3484.8	3674.8	767	1761.2	1856.2	3522.4	3712.4	860	1779.8	1874.8	3559.6	3749.6
580	1723.8	1818.8	3447.6	3637.6	674	1742.6	1837.6	3485.2	3675.2	768	1761.4	1856.4	3522.8	3712.8	861	1780.0	1875.0	3560.0	3750.0
581	1724.0	1819.0	3448.0	3638.0	675	1742.8	1837.8	3485.6	3675.6	769	1761.6	1856.6	3523.2	3713.2	862	1780.2	1875.2	3560.4	3750.4
582	1724.2	1819.2	3448.4	3638.4	676	1743.0	1838.0	3486.0	3676.0	770	1761.8	1856.8	3523.6	3713.6	863	1780.4	1875.4	3560.8	3750.8
583	1724.4	1819.4	3448.8	3638.8	677	1743.2	1838.2	3486.4	3676.4	771	1762.0	1857.0	3524.0	3714.0	864	1780.6	1875.6	3561.2	3751.2
584	1724.6	1819.6	3449.2	3639.2	678	1743.4	1838.4	3486.8	3676.8	772	1762.2	1857.2	3524.4	3714.4	865	1780.8	1875.8	3561.6	3751.6
585	1724.8	1819.8	3449.6	3639.6	679	1743.6	1838.6	3487.2	3677.2	773	1762.4	1857.4	3524.8	3714.8	866	1781.0	1876.0	3562.0	3752.0
586	1725.0	1820.0	3450.0	3640.0	680	1743.8	1838.8	3487.6	3677.6	774	1762.6	1857.6	3525.2	3715.2	867	1781.2	1876.2	3562.4	3752.4
587	1725.2	1820.2	3450.4	3640.4	681	1744.0	1839.0	3488.0	3678.0	775	1762.8	1857.8	3525.6	3715.6	868	1781.4	1876.4	3562.8	3752.8
588	1725.4	1820.4	3450.8	3640.8	682	1744.2	1839.2	3488.4	3678.4	776	1763.0	1858.0	3526.0	3716.0	869	1781.6	1876.6	3563.2	3753.2
589	1725.6	1820.6	3451.2	3641.2	683	1744.4	1839.4	3488.8	3678.8	777	1763.2	1858.2	3526.4	3716.4	870	1781.8	1876.8	3563.6	3753.6
590	1725.8	1820.8	3451.6	3641.6	684	1744.6	1839.6	3489.2	3679.2	778	1763.4	1858.4	3526.8	3716.8	871	1782.0	1877.0	3564.0	3754.0
591	1726.0	1821.0	3452.0	3642.0	685	1744.8	1839.8	3489.6	3679.6	779	1763.6	1858.6	3527.2	3717.2	872	1782.2	1877.2	3564.4	3754.4
592	1726.2	1821.2	3452.4	3642.4	686	1745.0	1840.0	3490.0	3680.0	780	1763.8	1858.8	3527.6	3717.6	873	1782.4	1877.4	3564.8	3754.8
593	1726.4	1821.4	3452.8	3642.8	687	1745.2	1840.2	3490.4	3680.4	781	1764.0	1859.0	3528.0	3718.0	874	1782.6	1877.6	3565.2	3755.2
594	1726.6	1821.6	3453.2	3643.2	688	1745.4	1840.4	3490.8	3680.8	782	1764.2	1859.2	3528.4	3718.4	875	1782.8	1877.8	3565.6	3755.6
595	1726.8	1821.8	3453.6	3643.6	689	1745.6	1840.6	3491.2	3681.2	783	1764.4	1859.4	3528.8	3718.8	876	1783.0	1878.0	3566.0	3756.0
596	1727.0	1822.0	3454.0	3644.0	690	1745.8	1840.8	3491.6	3681.6	784	1764.6	1859.6	3529.2	3719.2	877	1783.2	1878.2	3566.4	3756.4
597	1727.2	1822.2	3454.4	3644.4	691	1746.0	1841.0	3492.0	3682.0	785	1764.8	1859.8	3529.6	3719.6	878	1783.4	1878.4	3566.8	3756.8
598	1727.4	1822.4	3454.8	3644.8	692	1746.2	1841.2	3492.4	3682.4	786	1765.0	1860.0	3530.0	3720.0	879	1783.6	1878.6	3567.2	3757.2
599	1727.6	1822.6	3455.2	3645.2	693	1746.4	1841.4	3492.8	3682.8	787	1765.2	1860.2	3530.4	3720.4	880	1783.8	1878.8	3567.6	3757.6
600	1727.8	1822.8	3455.6	3645.6	694	1746.6	1841.6	3493.2	3683.2	788	1765.4	1860.4	3530.8	3720.8	881	1784.0	1879.0	3568.0	3758.0
601	1728.0	1823.0	3456.0	3646.0	695	1746.8	1841.8	3493.6	3683.6	789	1765.6	1860.6	3531.2	3721.2	882	1784.2	1879.2	3568.4	3758.4
602	1728.2	1823.2	3456.4	3646.4	696	1747.0	1842.0	3494.0	3684.0	790	1765.8	1860.8	3531.6	3721.6	883	1784.4	1879.4	3568.8	3758.8
603	1728.4	1823.4	3456.8	3646.8	697	1747.2	1842.2	3494.4	3684.4	791	1766.0	1861.0	3532.0	3722.0	884	1784.6	1879.6	3569.2	3759.2
604	1728.6	1823.6	3457.2	3647.2	698	1747.4	1842.4	3494.8	3684.8	792	1766.2	1861.2	3532.4	3722.4	885	1784.8	1879.8	3569.6	3759.6
605	1728.8	1823.8	3457.6	3647.6	699	1747.6	1842.6	3495.2	3685.2										

GSM1900 frequencies

CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX
512	1850,2	1930,2	3700,4	3860,4	606	1869,0	1949,0	3738,0	3898,0	700	1887,8	1967,8	3775,6	3935,6	794	1906,6	1986,6	3813,2	3973,2
513	1850,4	1930,4	3700,8	3860,8	607	1869,2	1949,2	3738,4	3898,4	701	1888,0	1968,0	3776,0	3936,0	795	1906,8	1986,8	3813,6	3973,6
514	1850,6	1930,6	3701,2	3861,2	608	1869,4	1949,4	3738,8	3898,8	702	1888,2	1968,2	3776,4	3936,4	796	1907,0	1987,0	3814,0	3974,0
515	1850,8	1930,8	3701,6	3861,6	609	1869,6	1949,6	3739,2	3899,2	703	1888,4	1968,4	3776,8	3936,8	797	1907,2	1987,2	3814,4	3974,4
516	1851,0	1931,0	3702,0	3862,0	610	1869,8	1949,8	3739,6	3899,6	704	1888,6	1968,6	3777,2	3937,2	798	1907,4	1987,4	3814,8	3974,8
517	1851,2	1931,2	3702,4	3862,4	611	1870,0	1950,0	3740,0	3900,0	705	1888,8	1968,8	3777,6	3937,6	799	1907,6	1987,6	3815,2	3975,2
518	1851,4	1931,4	3702,8	3862,8	612	1870,2	1950,2	3740,4	3900,4	706	1889,0	1969,0	3778,0	3938,0	800	1907,8	1987,8	3815,6	3975,6
519	1851,6	1931,6	3703,2	3863,2	613	1870,4	1950,4	3740,8	3900,8	707	1889,2	1969,2	3778,4	3938,4	801	1908,0	1988,0	3816,0	3976,0
520	1851,8	1931,8	3703,6	3863,6	614	1870,6	1950,6	3741,2	3901,2	708	1889,4	1969,4	3778,8	3938,8	802	1908,2	1988,2	3816,4	3976,4
521	1852,0	1932,0	3704,0	3864,0	615	1870,8	1950,8	3741,6	3901,6	709	1889,6	1969,6	3779,2	3939,2	803	1908,4	1988,4	3816,8	3976,8
522	1852,2	1932,2	3704,4	3864,4	616	1871,0	1951,0	3742,0	3902,0	710	1889,8	1969,8	3779,6	3939,6	804	1908,6	1988,6	3817,2	3977,2
523	1852,4	1932,4	3704,8	3864,8	617	1871,2	1951,2	3742,4	3902,4	711	1890,0	1970,0	3780,0	3940,0	805	1908,8	1988,8	3817,6	3977,6
524	1852,6	1932,6	3705,2	3865,2	618	1871,4	1951,4	3742,8	3902,8	712	1890,2	1970,2	3780,4	3940,4	806	1909,0	1989,0	3818,0	3978,0
525	1852,8	1932,8	3705,6	3865,6	619	1871,6	1951,6	3743,2	3903,2	713	1890,4	1970,4	3780,8	3940,8	807	1909,2	1989,2	3818,4	3978,4
526	1853,0	1933,0	3706,0	3866,0	620	1871,8	1951,8	3743,6	3903,6	714	1890,6	1970,6	3781,2	3941,2	808	1909,4	1989,4	3818,8	3978,8
527	1853,2	1933,2	3706,4	3866,4	621	1872,0	1952,0	3744,0	3904,0	715	1890,8	1970,8	3781,6	3941,6	809	1909,6	1989,6	3819,2	3979,2
528	1853,4	1933,4	3706,8	3866,8	622	1872,2	1952,2	3744,4	3904,4	716	1891,0	1971,0	3782,0	3942,0	810	1909,8	1989,8	3819,6	3979,6
529	1853,6	1933,6	3707,2	3867,2	623	1872,4	1952,4	3744,8	3904,8	717	1891,2	1971,2	3782,4	3942,4					
530	1853,8	1933,8	3707,6	3867,6	624	1872,6	1952,6	3745,2	3905,2	718	1891,4	1971,4	3782,8	3942,8					
531	1854,0	1934,0	3708,0	3868,0	625	1872,8	1952,8	3745,6	3905,6	719	1891,6	1971,6	3783,2	3943,2					
532	1854,2	1934,2	3708,4	3868,4	626	1873,0	1953,0	3746,0	3906,0	720	1891,8	1971,8	3783,6	3943,6					
533	1854,4	1934,4	3708,8	3868,8	627	1873,2	1953,2	3746,4	3906,4	721	1892,0	1972,0	3784,0	3944,0					
534	1854,6	1934,6	3709,2	3869,2	628	1873,4	1953,4	3746,8	3906,8	722	1892,2	1972,2	3784,4	3944,4					
535	1854,8	1934,8	3709,6	3869,6	629	1873,6	1953,6	3747,2	3907,2	723	1892,4	1972,4	3784,8	3944,8					
536	1855,0	1935,0	3710,0	3870,0	630	1873,8	1953,8	3747,6	3907,6	724	1892,6	1972,6	3785,2	3945,2					
537	1855,2	1935,2	3710,4	3870,4	631	1874,0	1954,0	3748,0	3908,0	725	1892,8	1972,8	3785,6	3945,6					
538	1855,4	1935,4	3710,8	3870,8	632	1874,2	1954,2	3748,4	3908,4	726	1893,0	1973,0	3786,0	3946,0					
539	1855,6	1935,6	3711,2	3871,2	633	1874,4	1954,4	3748,8	3908,8	727	1893,2	1973,2	3786,4	3946,4					
540	1855,8	1935,8	3711,6	3871,6	634	1874,6	1954,6	3749,2	3909,2	728	1893,4	1973,4	3786,8	3946,8					
541	1856,0	1936,0	3712,0	3872,0	635	1874,8	1954,8	3749,6	3909,6	729	1893,6	1973,6	3787,2	3947,2					
542	1856,2	1936,2	3712,4	3872,4	636	1875,0	1955,0	3750,0	3910,0	730	1893,8	1973,8	3787,6	3947,6					
543	1856,4	1936,4	3712,8	3872,8	637	1875,2	1955,2	3750,4	3910,4	731	1894,0	1974,0	3788,0	3948,0					
544	1856,6	1936,6	3713,2	3873,2	638	1875,4	1955,4	3750,8	3910,8	732	1894,2	1974,2	3788,4	3948,4					
545	1856,8	1936,8	3713,6	3873,6	639	1875,6	1955,6	3751,2	3911,2	733	1894,4	1974,4	3788,8	3948,8					
546	1857,0	1937,0	3714,0	3874,0	640	1875,8	1955,8	3751,6	3911,6	734	1894,6	1974,6	3789,2	3949,2					
547	1857,2	1937,2	3714,4	3874,4	641	1876,0	1956,0	3752,0	3912,0	735	1894,8	1974,8	3789,6	3949,6					
548	1857,4	1937,4	3714,8	3874,8	642	1876,2	1956,2	3752,4	3912,4	736	1895,0	1975,0	3790,0	3950,0					
549	1857,6	1937,6	3715,2	3875,2	643	1876,4	1956,4	3752,8	3912,8	737	1895,2	1975,2	3790,4	3950,4					
550	1857,8	1937,8	3715,6	3875,6	644	1876,6	1956,6	3753,2	3913,2	738	1895,4	1975,4	3790,8	3950,8					
551	1858,0	1938,0	3716,0	3876,0	645	1876,8	1956,8	3753,6	3913,6	739	1895,6	1975,6	3791,2	3951,2					
552	1858,2	1938,2	3716,4	3876,4	646	1877,0	1957,0	3754,0	3914,0	740	1895,8	1975,8	3791,6	3951,6					
553	1858,4	1938,4	3716,8	3876,8	647	1877,2	1957,2	3754,4	3914,4	741	1896,0	1976,0	3792,0	3952,0					
554	1858,6	1938,6	3717,2	3877,2	648	1877,4	1957,4	3754,8	3914,8	742	1896,2	1976,2	3792,4	3952,4					
555	1858,8	1938,8	3717,6	3877,6	649	1877,6	1957,6	3755,2	3915,2	743	1896,4	1976,4	3792,8	3952,8					
556	1859,0	1939,0	3718,0	3878,0	650	1877,8	1957,8	3755,6	3915,6	744	1896,6	1976,6	3793,2	3953,2					
557	1859,2	1939,2	3718,4	3878,4	651	1878,0	1958,0	3756,0	3916,0	745	1896,8	1976,8	3793,6	3953,6					
558	1859,4	1939,4	3718,8	3878,8	652	1878,2	1958,2	3756,4	3916,4	746	1897,0	1977,0	3794,0	3954,0					
559	1859,6	1939,6	3719,2	3879,2	653	1878,4	1958,4	3756,8	3916,8	747	1897,2	1977,2	3794,4	3954,4					
560	1859,8	1939,8	3719,6	3879,6	654	1878,6	1958,6	3757,2	3917,2	748	1897,4	1977,4	3794,8	3954,8					
561	1860,0	1940,0	3720,0	3880,0	655	1878,8	1958,8	3757,6	3917,6	749	1897,6	1977,6	3795,2	3955,2					
562	1860,2	1940,2	3720,4	3880,4	656	1879,0	1959,0	3758,0	3918,0	750	1897,8	1977,8	3795,6	3955,6					
563	1860,4	1940,4	3720,8	3880,8	657	1879,2	1959,2	3758,4	3918,4	751	1898,0	1978,0	3796,0	3956,0					
564	1860,6	1940,6	3721,2	3881,2	658	1879,4	1959,4	3758,8	3918,8	752	1898,2	1978,2	3796,4	3956,4					
565	1860,8	1940,8	3721,6	3881,6	659	1879,6	1959,6	3759,2	3919,2	753	1898,4	1978,4	3796,8	3956,8					
566	1861,0	1941,0	3722,0	3882,0	660	1879,8	1959,8	3759,6	3919,6	754	1898,6	1978,6	3797,2	3957,2					
567	1861,2	1941,2	3722,4	3882,4	661	1880,0	1960,0	3760,0	3920,0	755	1898,8	1978,8	3797,6	3957,6					
568	1861,4	1941,4	3722,8	3882,8	662	1880,2	1960,2	3760,4	3920,4	756	1899,0	1979,0	3798,0	3958,0					
569	1861,6	1941,6	3723,2	3883,2	663	1880,4	1960,4	3760,8	3920,8	757	1899,2	1979,2	3798,4	3958,4					
570	1861,8	1941,8	3723,6	3883,6	664	1880,6	1960,6	3761,2	3921,2	758	1899,4	1979,4	3798,8	3958,8					
571	1862,0	1942,0	3724,0	3884,0	665	1880,8	1960,8	3761,6	3921,6	759	1899,6	1979,6	3799,2	3959,2					
572	1862,2	1942,2	3724,4	3884,4	666	1881,0	1961,0	3762,0	3922,0	760	1899,8	1979,8	3799,6	3959,6					
573	1862,4	1942,4	3724,8	3884,8	667	1881,2	1961,2	3762,4	3922,4	761	1900,0	1980,0	3800,0	3960,0					
574	1862,6	1942,6	3725,2	3885,2	668	1881,4	1961,4	3762,8	3922,8	762	1900,2	1980,2	3800,4	3960,4					
575	1862,8	1942,8	3725,6	3885,6	669	1881,6	1961,6	3763,2	3923,2	763	1900,4	1980,4	3800,8	3960,8					
576	1863,0	1943,0	3726,0	3886,0	670	1881,8	1961,8	3763,6	3923,6	764	1900,6	1980,6	3801,2	3961,2					
577	1863,2	1943,2	3726,4	3886,4	671	1882,0	1962,0	3764,0	3924,0	765	1900,8	1980,8	3801,6	3961,6					
578	1863,4	1943,4	3726,8	3886,8	672	1882,2	1962,2	3764,4	3924,4	766	1901,0	1981,0	3802,0	3962,0					
579	1863,6	1943,6	3727,2	3887,2	673	1882,4	1962,4	3764,8	3924,8	767	1901,2	1981,2	3802,4	3962,4					
580	1863,8	1943,8	3727,6	3887,6	674	1882,6	1962,6	3765,2	3925,2	768	1901,4	1981,4	3802,8	3962,8					
581	1864,0	1944,0	3728,0	3888,0	675	1882,8	1962,8	3765,6	3925,6	769	1901,6	1981,6	3803,2	3963,2					
582	1864,2	1944,2	3728,4	3888,4	676	1883,0	1963,0	3766,0	3926,0	770	1901,8	1981,8	3803,6	3963,6					
583	1864,4	1944,4	3728,8	3888,8	677	1883,2	1963,2	3766,4	3926,4	771	1902,0	1982,0	3804,0	3964,0					
584	1864,6	1944,6	3729,2	3889,2	678	1883,4	1963,4	3766,8	3926,8	772	1902,2	1982,2	3804,4	3964,4					
585	1864,8	1944,8	3729,6	3889,6	679	1883,6	1963,6	3767,2	3927,2	773	1902,4	1982,4	3804,8	3964,8					
586	1865,0	1945,0	3730,0	3890,0	680	1883,8	1963,8	3767,6	3927,6	774	1902,6	1982,6	3805,2	3965,2					
587	1865,2	1945,2	3730,4	3890,4	681	1884,0	1964,0	3768,0	3928,0	775	1902,8	1982,8	3805,6	3965,6					
588	1865,4	1945,4	3730,8	3890,8	682	1884,2	1964,2	3768,4	3928,4	776	1903,0	1983,0	3806,0	3966,0					
589	1865,6	1945,6	3731,2	3891,2	683	1884,4	1964,4	3768,8	3928,8	777	1903,2	1983,2	3806,4	3966,4					
590	1865,8	1945,8	3731,6	3891,6	684	1884,6	1964,6	3769,2	3929,2	778	1903,4	1983,4	3806,8	3966,8					
591	1866,0	1946,0	3732,0	3892,0	685	1884,8	1964,8	3769,6	3929,6	779	1903,6	1983,6	3807,2	3967,2					
592	1866,2	1946,2	3732,4	3892,4	686	1885,0	1965,0	3770,0	3930,0	780	1903,8	1983,8	3807,6	3967,6					
593	1866,4	1946,4	3732,8	3892,8	687	1885,2	1965,2	3770,4	3930,4	781	1904,0	1984,0	3808,0	3968,0					
594	1866,6	1946,6	3733,2	3893,2	688	1885,4	1965,4	3770,8	3930,8	782	1904,2	1984,2	3808,4	3968,4					
595	1866,8	1946,8	3733,6	3893,6	689	1885,6	1965,6	3771,2	3931,2	783	1904,4	1984,4	3808,8	3968,8					
596	1867,0	1947,0	3734,0	3894,0	690	1885,8	1965,8	3771,6	3931,6	784	1904,6	1984,6	3809,2	3969,2					
597	1867,2	1947,2	3734,4	3894,4	691	1886,0	1966,0	3772,0	3932,0	785	1904,8	1984,8	3809,6	3969,6					
598	1867,4	1947,4	3734,8	3894,8	692	1886,2	1966,2	3772,4	3932,4	786	1905,0	1985,0	3810,0	3970,0					
599	1867,6	1947,6	3735,2	3895,2	693	1886,4	1966,4	3772,8	3932,8	787	1905,2	1985,2	3810,4	3970,4					
600	1867,8	1947,8	3735,6	3895,6	694	1886,6	1966,6	3773,2	3933,2	788	1905,4	1985,4	3810,8	3970,8					
601	1868,0	1948,0	3736,0	3896,0	695	1886,8	1966,8	3773,6	3933,6	789	1905,6	1985,6	3811,2	3971,2					
602	1868,2	1948,2	3736,4	3896,4	696	1887,0	1967,0	3774,0	3934,0	790	1905,8	1985,8	3811,6	3971,6					
603	1868,4	1948,4	3736,8	3896,8	697	1887,2	1967,2	3774,4	3934,4	791	1906,0	1986,0	3812,0	3972,0					
604	1868,6	1948,6	3737,2	3897,2	698	1887,4	1967,4	3774,8	3934,8	792	1906,2	1986,2	3812,4	3972,4					
605	1868,8	1948,8	3737,6	3897,6	699	1887,6	1967,6	3775,2	3935,2	793	1906,4	1986,4	3812,8	3972,8					

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9 — RM-198 schematics

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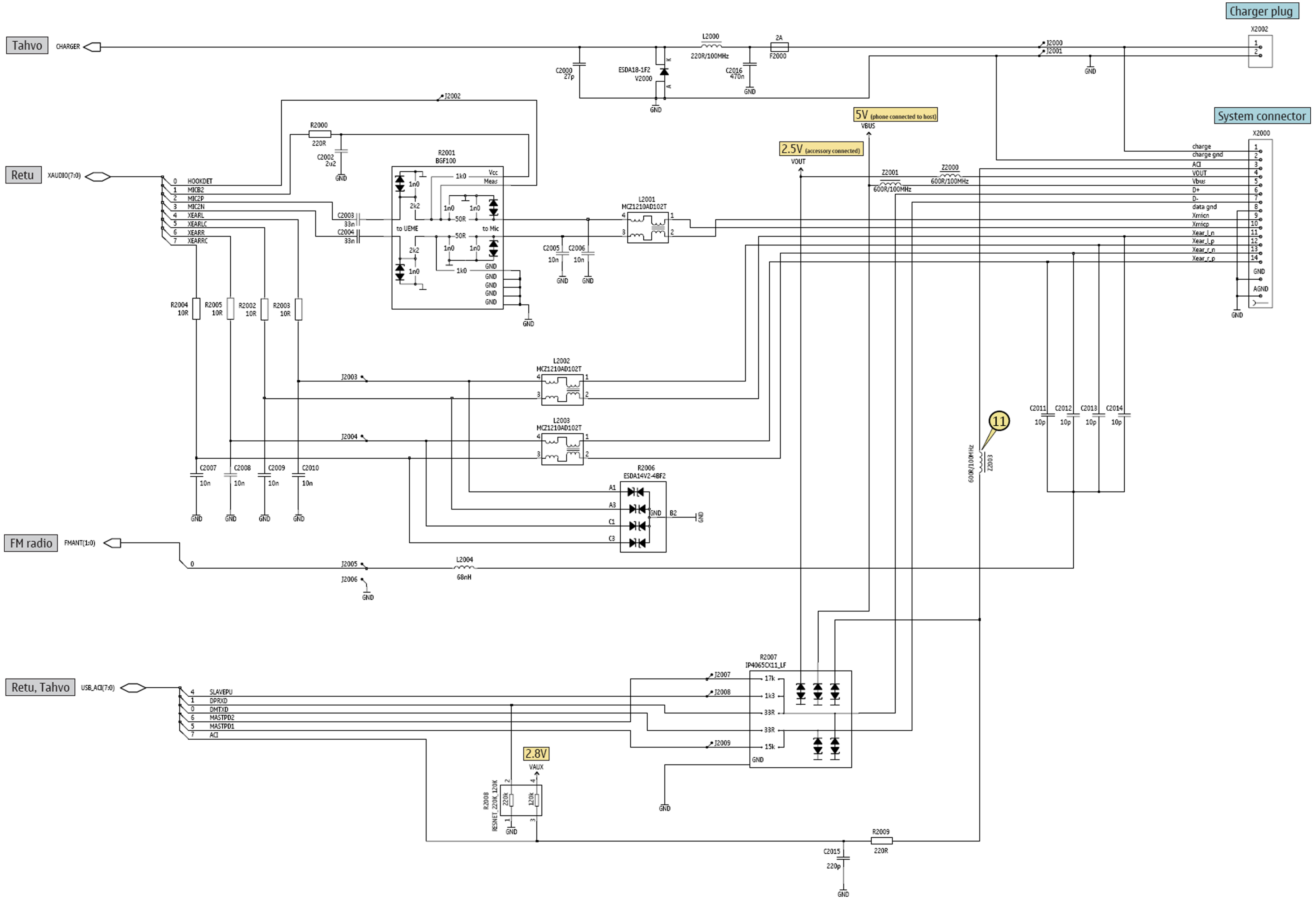
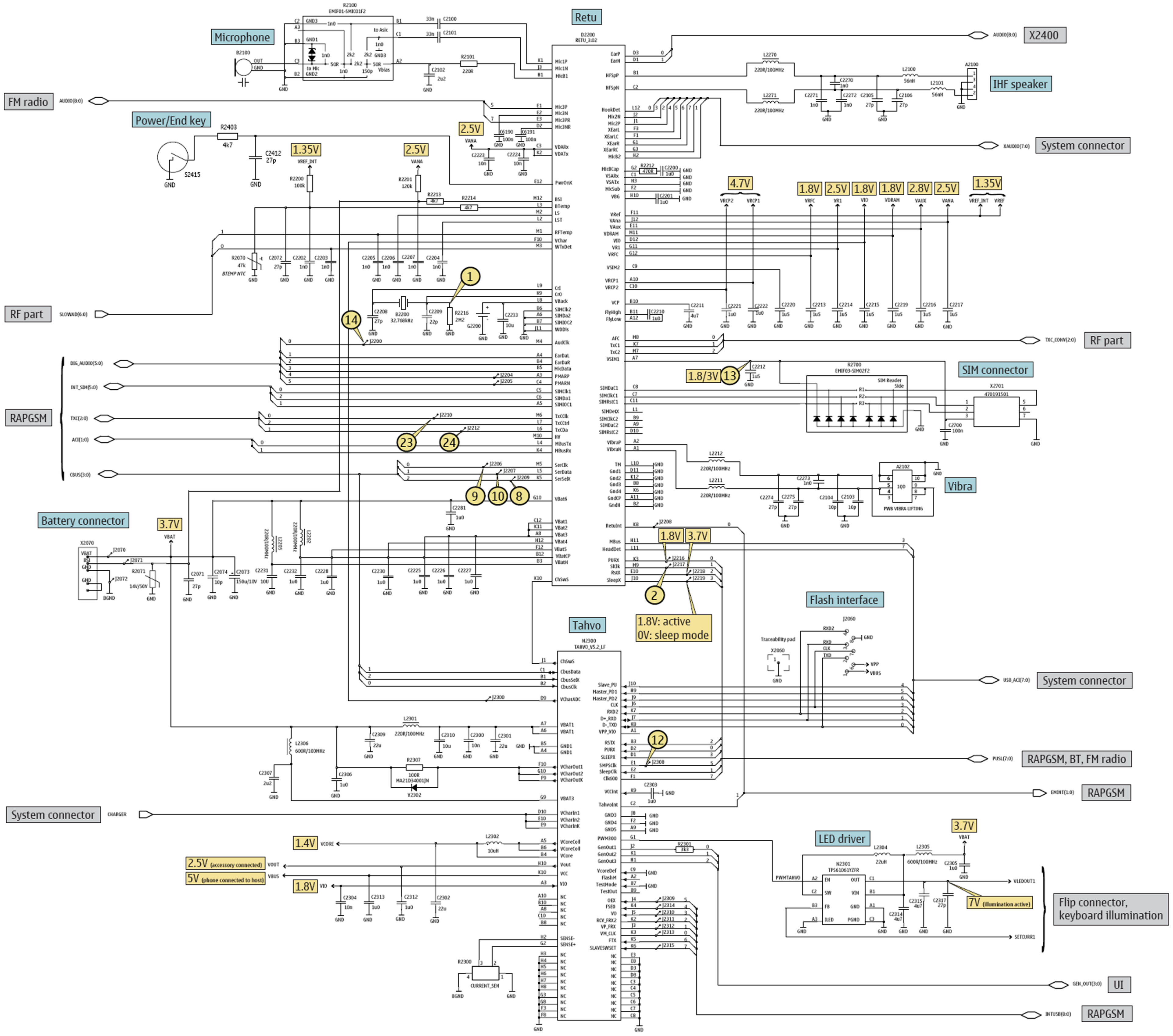
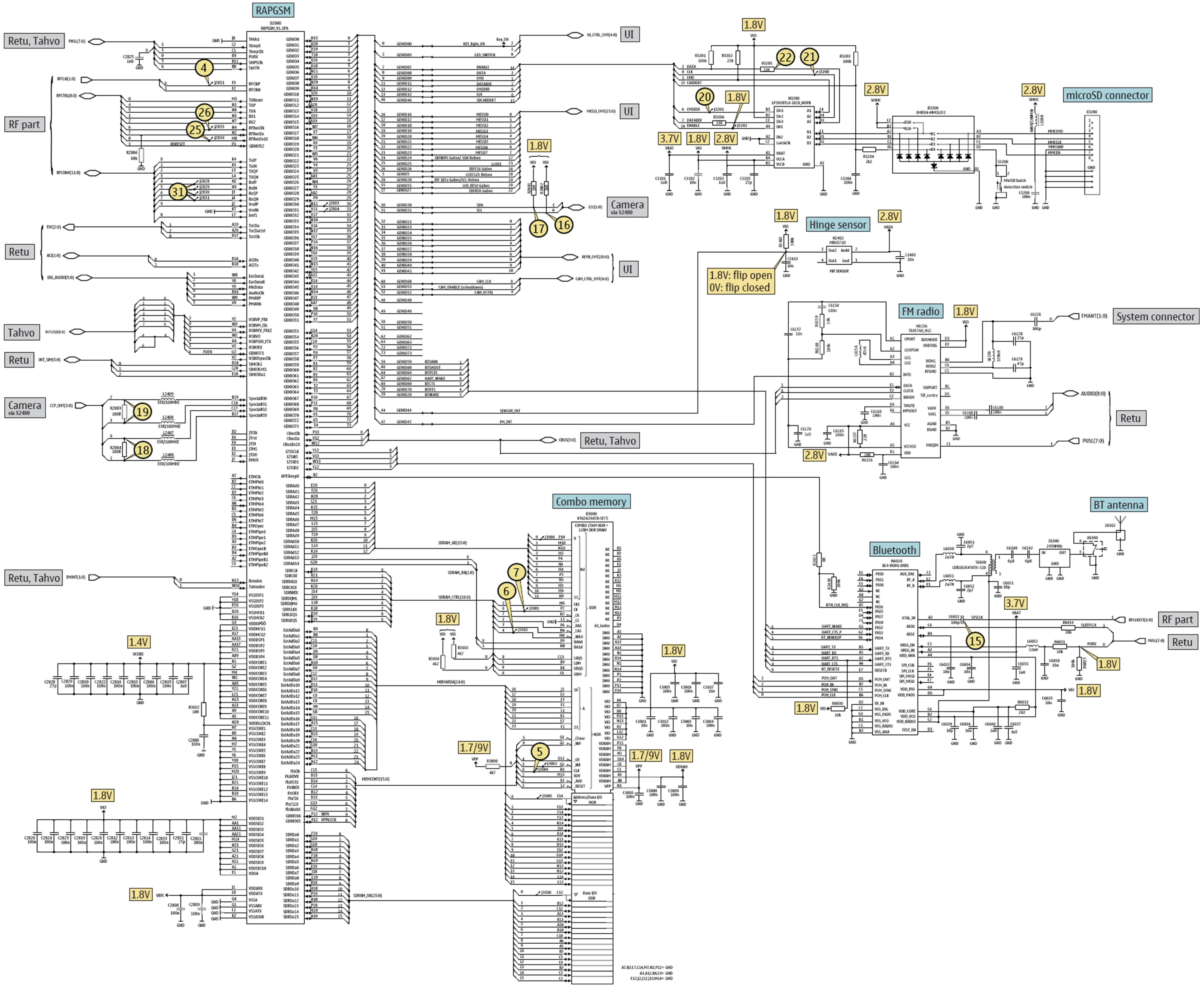
RM-198 system connector


Tahvo
CHARGER
Retu
XAUDIO(7:0)
FM radio
FMANT(1:0)
Retu, Tahvo
USB_ACI(7:0)
Charger plug
X2002
System connector
X2000
5V (phone connected to host)
VBUS
2.5V (accessory connected)
VOUT
2.8V
VAUX
0 HOOKDET
1 MICB2
2 MIC2P
3 MIC2N
4 XEARL
5 XEARLC
6 XEARR
7 XEARRC
4 SLAVEPU
1 DPRXD
0 DMTXD
6 MASTPD2
5 MASTPD1
7 ACI
charge
charge gnd
ACI
VOUT
Vbus
D+
D-
data gnd
Xmicn
Xmicp
Xear_l_n
Xear_l_p
Xear_r_n
Xear_r_p
GND
AGND
L2000
220R/100MHz
2A
F2000
C2000
27p
ESDA18-1F2
V2000
C2016
470n
J2000
J2001
J2002
J2003
J2004
J2005
J2006
J2007
J2008
J2009
R2000
220R
C2002
2u2
R2001
BGF100
1k0
Vcc
Meas
1n0
2k2
50R
to UEME
to Mic
C2003
33n
C2004
33n
L2001
MCZ1210AD102T
C2005
10n
C2006
10n
Z2001
600R/100MHz
Z2000
600R/100MHz
R2004
10R
R2005
10R
R2002
10R
R2003
10R
L2002
MCZ1210AD102T
L2003
MCZ1210AD102T
C2007
10n
C2008
10n
C2009
10n
C2010
10n
R2006
ESDA14V2-4BF2
A1
A3
C1
C3
B2
C2011
10p
C2012
10p
C2013
10p
C2014
10p
11
Z2003
600R/100MHz
L2004
68nH
R2007
IP4065CX11_LF
17k
1k3
33R
33R
15k
R2008
RESNET_220K_120K
220k
120k
R2009
220R
C2015
220p

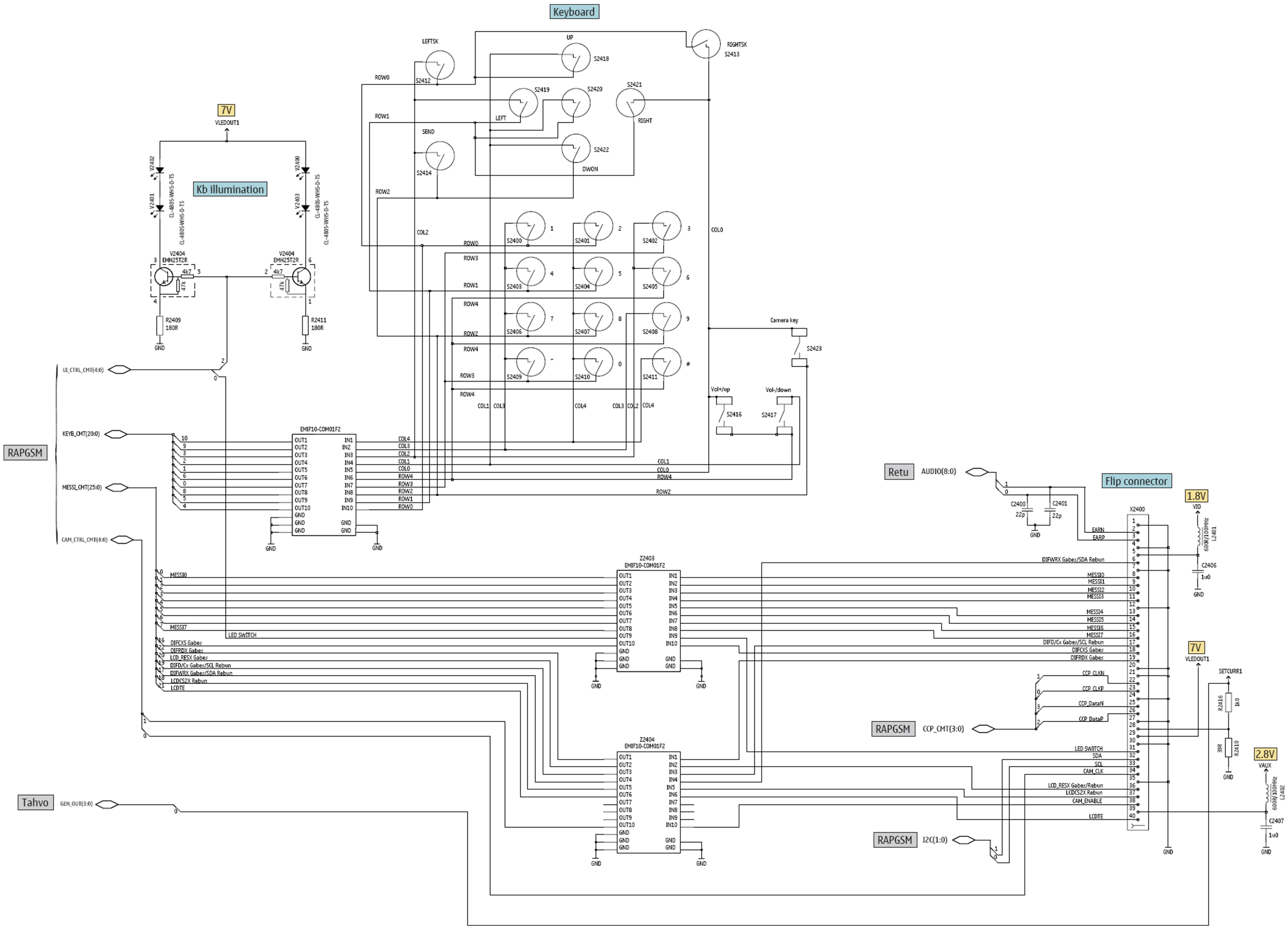
RM-198 RETU, TAHVO, LED driver


Retu
D2200
RETU_3.02
Microphone
FM radio
Power/End key
RF part
RAPGSM
Battery connector
3.7V
1.35V
2.5V
2.5V
4.7V
1.8V
2.5V
1.8V
1.8V
2.8V
2.5V
1.35V
X2400
IHF speaker
System connector
RF part
SIM connector
1.8/3V
Vibra
1.8V
3.7V
1.8V: active
0V: sleep mode
Flash interface
Tahvo
N2300
TAHVO_V5.2_LF
System connector
RAPGSM, BT, FM radio
RAPGSM
System connector
1.4V
2.5V (accessory connected)
5V (phone connected to host)
1.8V
LED driver
3.7V
7V (illumination active)
Flip connector,
keyboard illumination
UI
RAPGSM
1
2
8
9
10
12
13
14
23
24

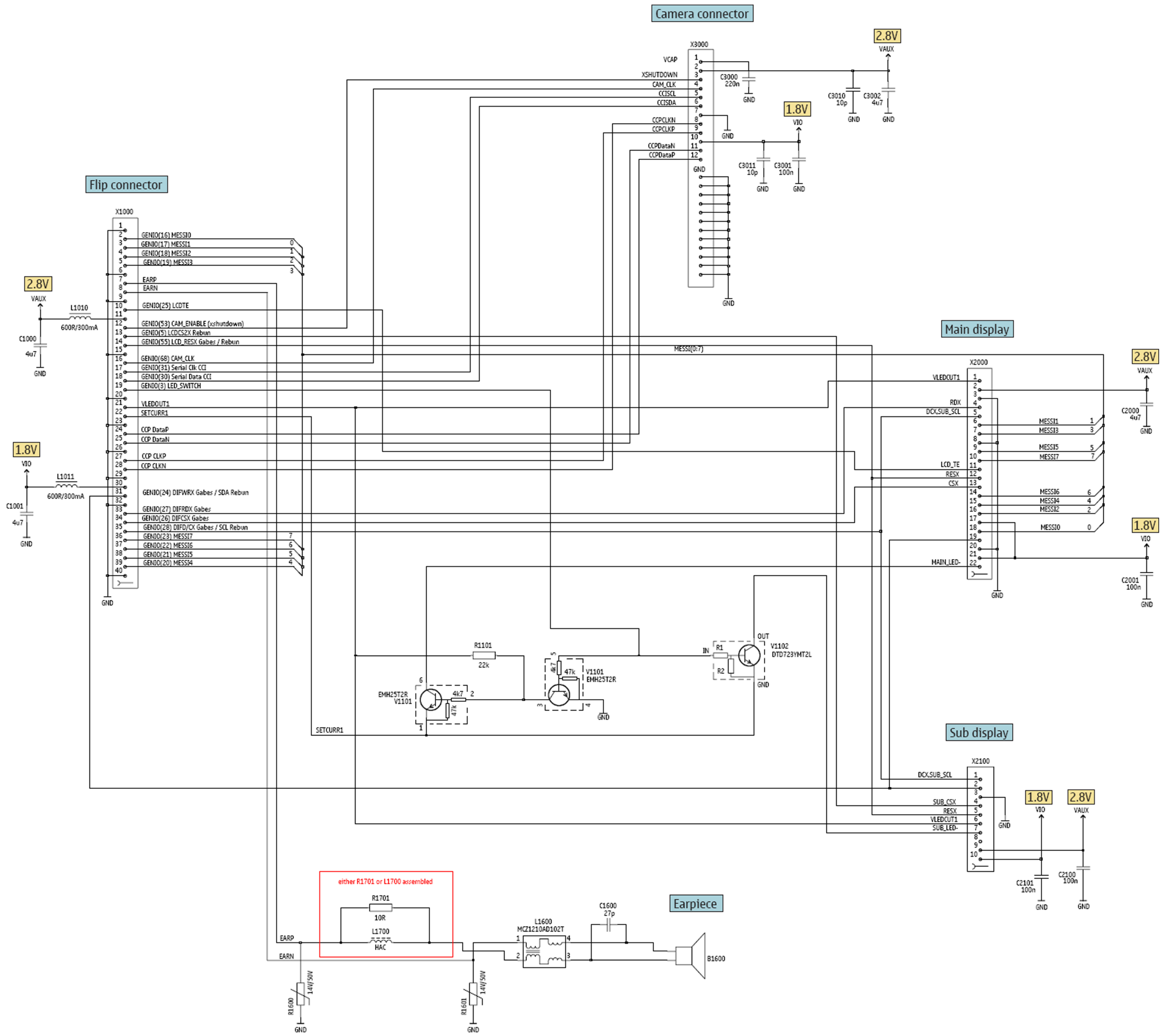
RM-198 RAPGSM, Memories, FM radio, Bluetooth


RAPGSM
Retu, Tahvo
4
RF part
26
25
31
Retu
Tahvo
Retu
Camera
via X2400
19
18
Retu, Tahvo
1.4V
1.8V
1.8V
UI
UI
UI
1.8V
Camera
via X2400
17
16
Retu, Tahvo
Combo memory
7
6
1.8V
1.8V
1.7/9V
5
1.7/9V
1.8V
1.8V
22
21
20
1.8V
2.8V
3.7V
1.8V
2.8V
2.8V
2.8V
microSD connector
1.8V
Hinge sensor
2.8V
1.8V: flip open
0V: flip closed
FM radio
1.8V
System connector
Retu
2.8V
BT antenna
Bluetooth
3.7V
RF part
Retu
15
1.8V
1.8V
1.8V

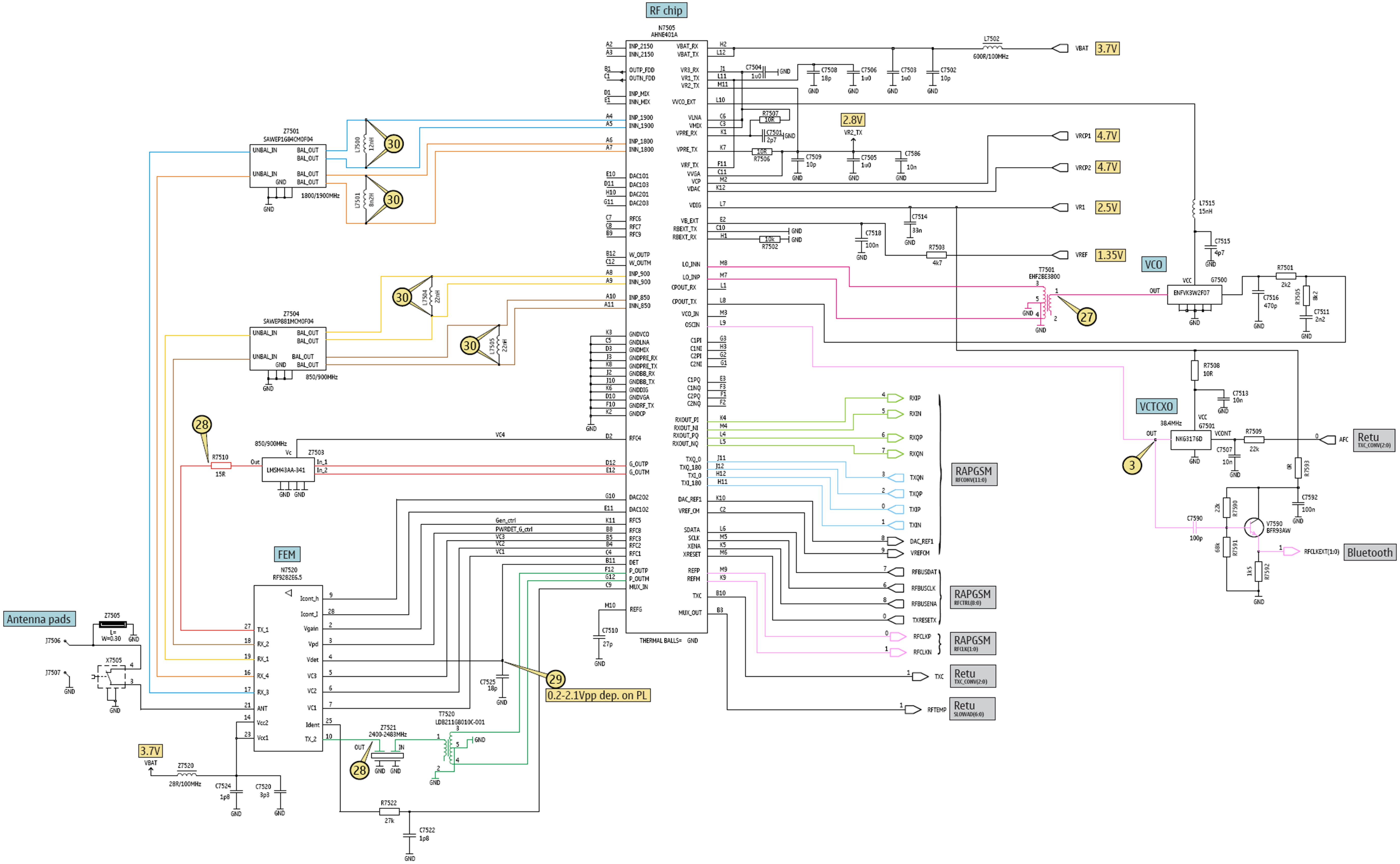
RM-198 user interface


Keyboard
LEFTSK
S2412
UP
S2418
RIGHTSK
S2413
S2419
S2420
S2421
LEFT
RIGHT
SEND
S2414
S2422
DWON
ROW0
ROW1
ROW2
ROW3
ROW4
COL0
COL1
COL2
COL3
COL4
S2400
S2401
S2402
S2403
S2404
S2405
S2406
S2407
S2408
S2409
S2410
S2411
1
2
3
4
5
6
7
8
9
0
#
Camera key
S2423
Vol+/up
S2416
Vol-/down
S2417
7V
VLEDOUT1
Kb illumination
V2402
V2401
V2400
V2403
CL-480S-WHS-D-TS
V2404
EMH25T2R
4k7
47k
R2409
180R
R2411
180R
GND
RAPGSM
UI_CTRL_CMT(4:0)
KEYB_CMT(20:0)
MESSI_CMT(25:0)
CAM_CTRL_CMT(4:0)
EMIF10-COM01F2
OUT1
IN1
MESSI0
MESSI7
LED SWITCH
DIFCKS Gabes
DIFRDX Gabes
LCD_RESX Gabes
DIFD/Cx Gabes/SCL Rebun
DIFWRX Gabes/SDA Rebun
LCDCS2X Rebun
LCDTE
Z2403
Z2404
Tahvo
GEN_OUT(3:0)
Retu
AUDIO(8:0)
C2400
22p
C2401
22p
Flip connector
X2400
1.8V
VIO
L2401
600R/100MHz
C2406
1u0
EARN
EARP
DIFWRX Gabes/SDA Rebun
MESSI1
MESSI2
MESSI3
MESSI4
MESSI5
MESSI6
DIFD/Cx Gabes/SCL Rebun
DIFCKS Gabes
DIFRDX Gabes
CCP_CLKN
CCP_CLKP
CCP_DataN
CCP_DataP
CCP_CMT(3:0)
LED SWITCH
SDA
SCL
CAM_CLK
LCD_RESX Gabes/Rebun
LCDCS2X Rebun
CAM_ENABLE
LCDTE
I2C(1:0)
SETCURR1
R2416
1k0
R2410
39R
2.8V
VAUX
L2402
C2407

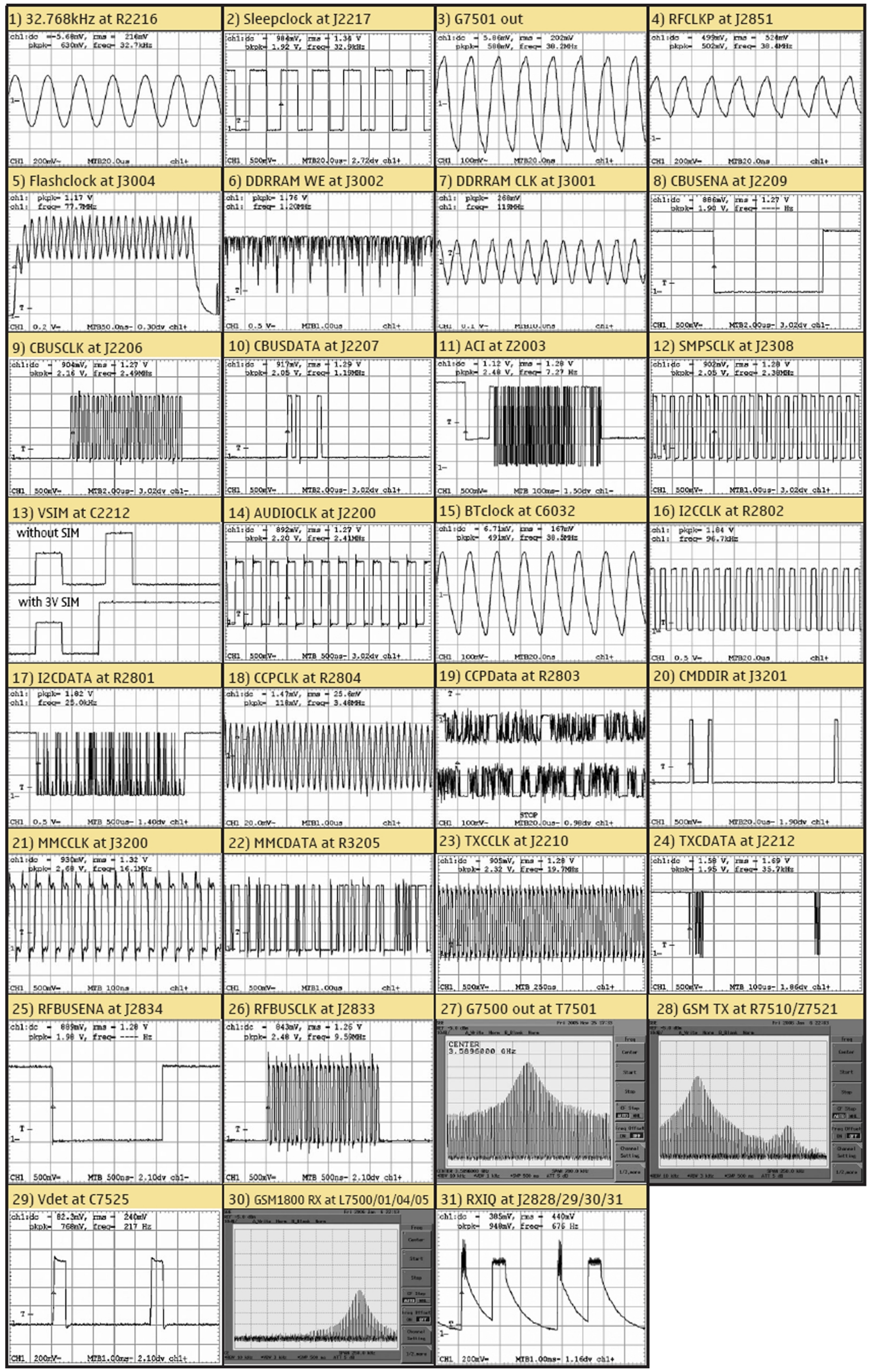
RM-198 flip PWB

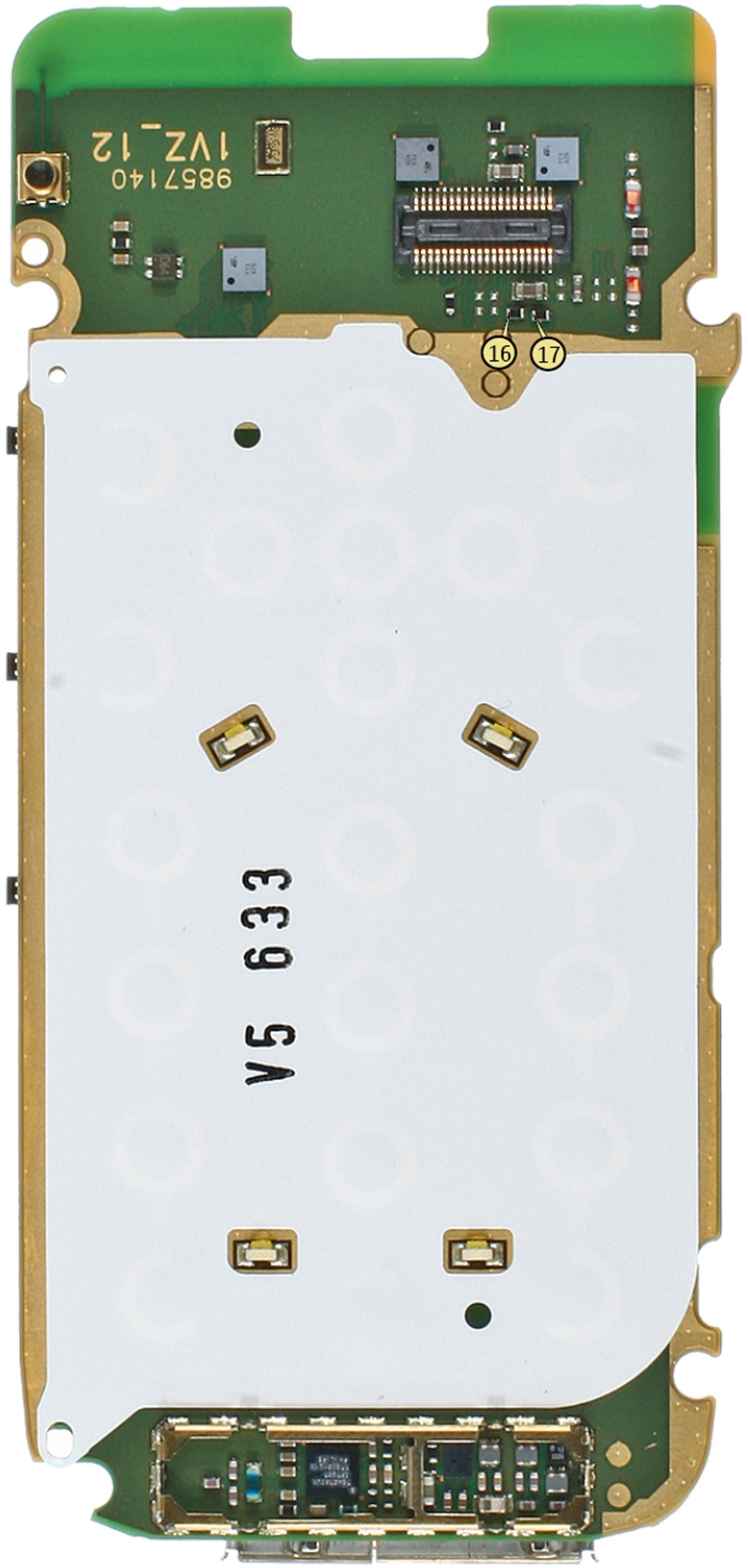

Camera connector
X3000
VCAP
XSHUTDOWN
CAM_CLK
CCISCL
CCISDA
CCPCLKN
CCPCLKP
CCPDataN
CCPDataP
GND
C3000
220n
2.8V
VAUX
C3010
10p
C3002
4u7
1.8V
VIO
C3011
10p
C3001
100n
Flip connector
X1000
GENIO(16) MESSI0
GENIO(17) MESSI1
GENIO(18) MESSI2
GENIO(19) MESSI3
EARP
EARN
GENIO(25) LCDTE
GENIO(53) CAM_ENABLE (xshutdown)
GENIO(5) LCDCS2X Rebun
GENIO(55) LCD_RESX Gabes / Rebun
GENIO(68) CAM_CLK
GENIO(31) Serial Clk CCI
GENIO(30) Serial Data CCI
GENIO(3) LED_SWITCH
VLEDOUT1
SETCURR1
CCP DataP
CCP DataN
CCP CLKP
CCP CLKN
GENIO(24) DIFWRX Gabes / SDA Rebun
GENIO(27) DIFRDX Gabes
GENIO(26) DIFCSX Gabes
GENIO(28) DIFD/CX Gabes / SCL Rebun
GENIO(23) MESSI7
GENIO(22) MESSI6
GENIO(21) MESSI5
GENIO(20) MESSI4
L1010
600R/300mA
C1000
4u7
L1011
600R/300mA
C1001
4u7
MESSI[0:7]
Main display
X2000
VLEDCUT1
RDX
DCX,SUB_SCL
LCD_TE
RESX
CSX
MAIN_LED-
MESSI1
MESSI3
MESSI5
MESSI7
MESSI6
MESSI4
MESSI2
MESSI0
C2000
4u7
C2001
100n
R1101
22k
EMH25T2R
V1101
4k7
47k
V1101
EMH25T2R
IN
R1
R2
OUT
V1102
DTD723YMT2L
SETCURR1
Sub display
X2100
DCX,SUB_SCL
SUB_CSX
RESX
VLEDCUT1
SUB_LED-
C2101
100n
C2100
100n
either R1701 or L1700 assembled
R1701
10R
L1700
HAC
EARP
EARN
R1600
14V/50V
R1601
14V/50V
L1600
MCZ1210AD102T
C1600
27p
Earpiece
B1600

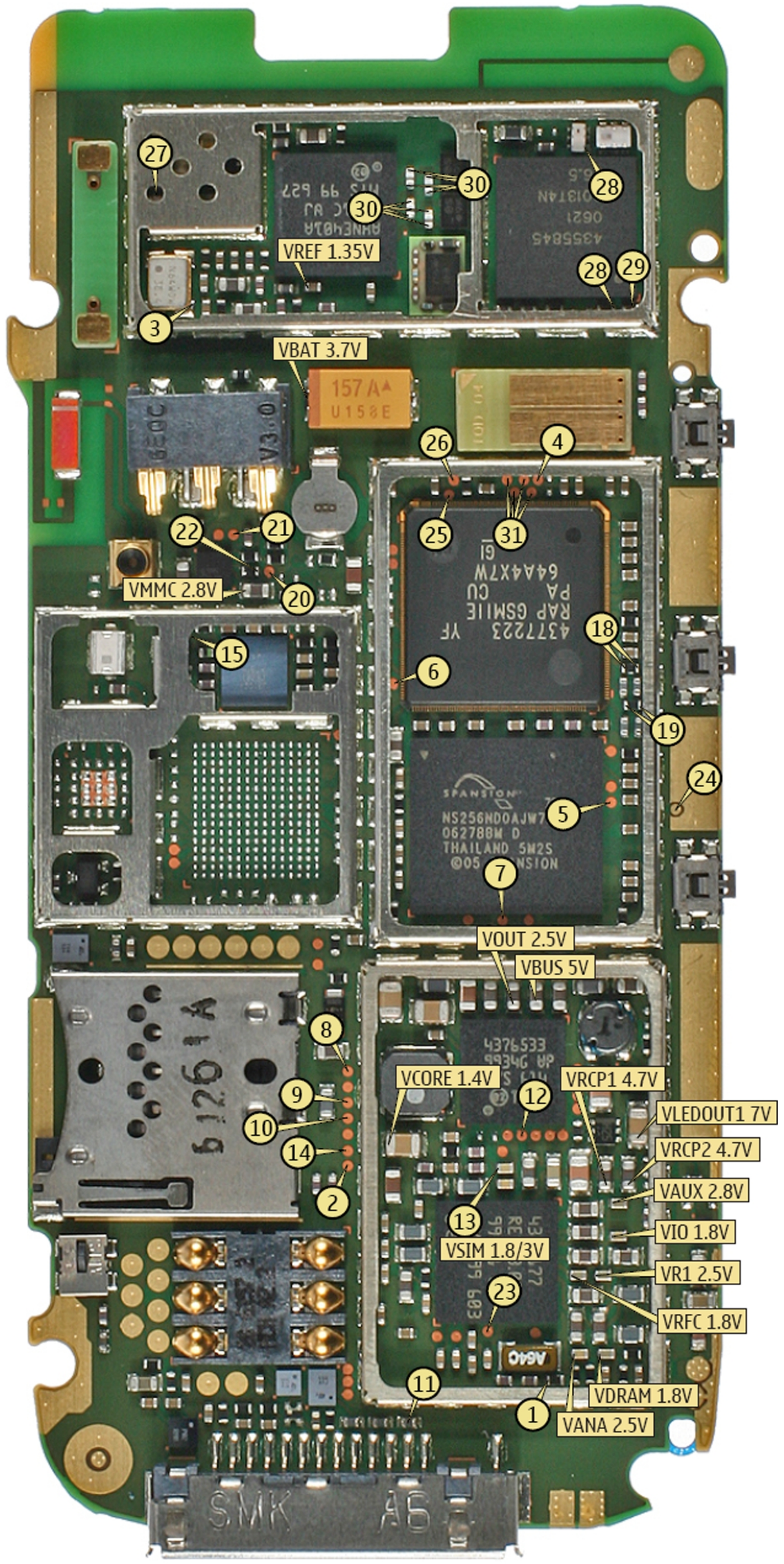
RM-198 RF part


RF chip
N7505
AHNE401A
FEM
N7520
RF9282E6.5
VCO
G7500
ENFVK3W2F07
VCTCXO
G7501
NKG3176D
38.4MHz
Antenna pads
Z7501
SAWEP1G84CM0F04
1800/1900MHz
Z7504
SAWEP881MCM0F04
850/900MHz
Z7503
LMSM43AA-341
T7501
EHF2BE3800
T7520
LDB211G8010C-001
Z7521
2400-2483MHz
L7502
600R/100MHz
Z7520
28R/100MHz
VBAT
3.7V
2.8V
VR2_TX
VRCP1
4.7V
VRCP2
4.7V
VR1
2.5V
VREF
1.35V
RXIP
RXIN
RXQP
RXQN
TXQN
TXQP
TXIP
TXIN
DAC_REF1
VREFCM
RFBUSDAT
RFBUSCLK
RFBUSENA
TXRESETX
RFCLKP
RFCLKN
TXC
RFTEMP
RAPGSM
RFCONV(11:0)
RAPGSM
RFCTRL(8:0)
RAPGSM
RFCLK(1:0)
Retu
TXC_CONV(2:0)
Retu
SLOWAD(6:0)
AFC
Retu
TXC_CONV(2:0)
RFCLKEXT(1:0)
Bluetooth
V7590
BFR93AW
THERMAL BALLS= GND
0.2-2.1Vpp dep. on PL
30
30
30
30
27
28
28
29
3
GND
J7506
J7507
X7505
Z7505
R7510
15R
R7522
27k
C7522
1p8
C7525
18p
C7524
1p8
C7520
3p3
C7510
27p
L7500
12nH
L7501
8n2H
L7504
22nH
L7505
22nH
L7515
15nH
R7501
2k2
R7503
4k7
R7508
10R
R7509
22k
R7502
10k
R7506
10R
R7507
10R
C7504
1u0
C7508
18p
C7506
1u0
C7503
1u0
C7502
10p
C7509
10p
C7505
1u0
C7586
10n
C7501
2p7
C7514
33n
C7518
100n
C7515
4p7
C7516
470p
C7511
2n2
C7513
10n
C7507
10n
C7592
100n
C7590
100p
R7590
22k
R7591
68k
R7592
1k5
R7593
0R
R7505
8k2

RM-198 signal overview






27
30
30
28
28
29
3
VREF 1.35V
VBAT 3.7V
26
4
22
21
25
31
VMMC 2.8V
20
18
15
6
19
24
5
7
VOUT 2.5V
VBUS 5V
8
VCORE 1.4V
VRCP1 4.7V
12
9
VLEDOUT1 7V
10
14
VRCP2 4.7V
VAUX 2.8V
2
13
VIO 1.8V
VSIM 1.8/3V
VR1 2.5V
23
VRFC 1.8V
11
1
VDRAM 1.8V
VANA 2.5V

RM-198 component finder

B	
B2100	Q1
B2200	P6
C	
C2000	N8
C2001	N8
C2002	R4
C2003	R4
C2004	R4
C2005	R3
C2006	R3
C2007	Q2
C2008	Q3
C2009	Q3
C2010	Q3
C2011	R3
C2012	R3
C2013	R3
C2014	R3
C2015	Q4
C2016	P8
C2071	G3
C2072	P2
C2073	E5
C2074	F2
C2100	Q2
C2101	Q2
C2102	Q2
C2103	E8
C2104	E8
C2105	D2
C2106	C2
C2200	O5
C2201	P7
C2202	P8
C2203	P6
C2204	P6
C2205	P5
C2206	P6
C2207	P7
C2208	Q6
C2209	Q6
C2210	N7
C2211	N7
C2212	N6
C2213	O7
C2214	O7
C2215	O7
C2216	O7
C2217	P7
C2218	P6
C2219	P7
C2220	N6
C2221	N8
C2222	N7
C2223	O5
C2224	P5
C2225	P7
C2226	O7
C2227	N6
C2228	O7
C2229	N6
C2230	P7
C2231	N5
C2232	O7
C2233	G4
C2270	O5
C2271	O5
C2272	O5
C2273	N6
C2274	N6
C2275	N5
C2281	O8
C2300	M5
C2301	L5
C2302	N5
C2303	L7
C2304	N6
C2305	L8
C2306	M4
C2307	L6
C2309	L5
C2310	L6
C2312	L6
C2313	L7
C2314	M7
C2315	N8
C2316	N8
C2317	O8
C2318	L8
C2400	N4
C2401	N4
C2402	D7
C2403	D2
C2404	D2
C2406	C3
C2407	D3
C2410	D3
C2411	D3
C2412	N6
C2413	C7
C2415	B3
C2416	D2
C2700	Q3
C2800	H8
C2801	F7
C2803	H8
C2805	F7
C2806	F8
C2807	I5
C2808	G8
C2809	G8
C2812	H8
C2813	F5
C2814	G8
C2815	F7
C2816	I5
C2819	I5
C2820	F6
C2822	F5
C2823	I6
C2824	J5
C2825	F7
C2826	I7
C2828	I7
C2829	G8
C2830	H5
C2831	I7
C2833	I6
C3000	K5
C3001	J5
C3002	K5
C3003	J8
C3004	J8
C3005	J8
C3006	K8
C3007	K8
C3008	J8
C3009	K8
C3200	L2
C3201	G2
C3202	G3
C3203	H3
C3204	L4
C3205	G3
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C6033	H4
C6034	H3
C6035	I4
C6036	H4
C6037	H4
C6038	H4
C6039	H3
C6040	I4
C6051	H3
C6052	I3
C6055	H2
C6056	H4
C6157	Q4
C6158	Q5
C6164	Q5
C6165	R6
C6168	Q6
C6170	R5
C6176	R6
C6178	R6
C6179	Q6
C6188	Q6
C6189	Q6
C6190	P5
C6191	P5
C6340	I2
C6342	I2
C7501	B4
C7502	D4
C7503	D3
C7504	B4
C7505	D3
C7506	D3
C7507	D3
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C7510	D4
C7511	C3
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C7514	D3
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C7518	D4
C7520	B7
C7522	D6
C7523	B7
C7524	D6
C7525	D8
C7586	D5
C7590	K1
C7592	J1
D	
D2200	O6
D2800	H6
D3000	J6
F	
F2000	P8
G	
G2200	G4
G7500	B3
G7501	D2
J	
J2000	P8
J2001	Q8
J2002	P6
J2003	Q3
J2004	Q3
J2005	R2
J2006	Q2
J2007	Q4
J2008	Q4
J2009	P4
J2060	P2
J2070	E3
J2071	E3
J2072	E4
J2200	N4
J2204	P5
J2205	P6
J2206	M4
J2207	N4
J2209	M4
J2210	P6
J2212	J8
J2216	N6
J2217	N4
J2218	M4
J2219	N4
J2300	N6
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J2309	M7
J2310	M7
J2311	N7
J2312	M7
J2313	N7
J2314	N7
J2315	M7
J2803	G5
J2804	G5
J2828	F6
J2829	F6
J2830	F6
J2831	F6
J2833	F6
J2834	F6
J2851	F7
J3000	K6
J3001	K6
J3002	I5
J3003	K6
J3004	J7
J3005	J7
J3006	I7
J3112	L4
J3113	L3
J3114	L3
J3115	L3
J3116	L2
J3117	L2
J3118	L4
J3119	L4
J3200	G3
J3201	G3
J3203	G3
J7506	A8
J7507	C8
L	
L2000	O8
L2001	Q3
L2002	Q3
L2003	R3
L2004	R3
L2100	D2
L2101	C2
L2202	P8
L2205	P8
L2211	N5
L2212	N6
L2270	O5
L2271	O5
L2301	L5
L2302	M5
L2304	M7
L2305	L7
L2306	M4
L2401	B3
L2402	D2
L2406	I8
L2407	I8
L2408	I8
L2409	I8
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L6031	I3
L6032	I4
L6156	R5
L6176	R6
L7500	C5
L7501	C5
L7502	D4
L7503	D7
L7504	C5
L7505	C5
L7515	C3
N	
N2300	M6
N2301	M8
N2402	D7
N3200	G3
N6030	H3
N6156	Q5
N7505	C4
N7520	C7
R	
R2000	Q4
R2001	Q4
R2002	Q3
R2003	Q3
R2004	Q2
R2005	Q3
R2006	Q3
R2007	Q4
R2008	Q4
R2009	Q4
R2070	P2
R2071	E3
R2100	Q2
R2101	P2
R2102	D2
R2103	C2
R2200	P8
R2201	P7
R2212	O5
R2213	P7
R2214	P8
R2216	Q7
R2301	M8
R2307	L4
R2402	D7
R2403	N6
R2404	G1
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R2411	N7
R2416	B3
R2420	H4
R2422	G4
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R3000	J5
R3002	H8
R3003	I8
R3004	K7
R3200	L1
R3201	G4
R3202	G3
R3203	K5
R3204	L4
R3205	G3
R3206	G4
R6030	H4
R6031	H4
R6032	I4
R6034	H3
R6035	H4
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R7507	B4
R7508	D3
R7509	D3
R7510	D7
R7522	D7
R7590	K1
R7591	K1
R7592	K2
R7593	J1
S	
S2416	F8
S2417	H8
S2423	K8
S3200	O1
T	
T6030	H2
T7501	C2
T7520	B7
V	
V2000	O8
V2302	L4
V2400	O6
V2401	I6
V2402	I3
V2403	O3
V2404	N7
V7590	K1
X	
X2000	R4
X2002	R7
X2060	B6
X2070	F3
X2400	C3
X2701	P3
X3200	M2
X6300	G2
X7505	C8
Z	
Z2000	Q5
Z2001	Q4
Z2003	Q5
Z2400	D6
Z2403	C4
Z2404	C2
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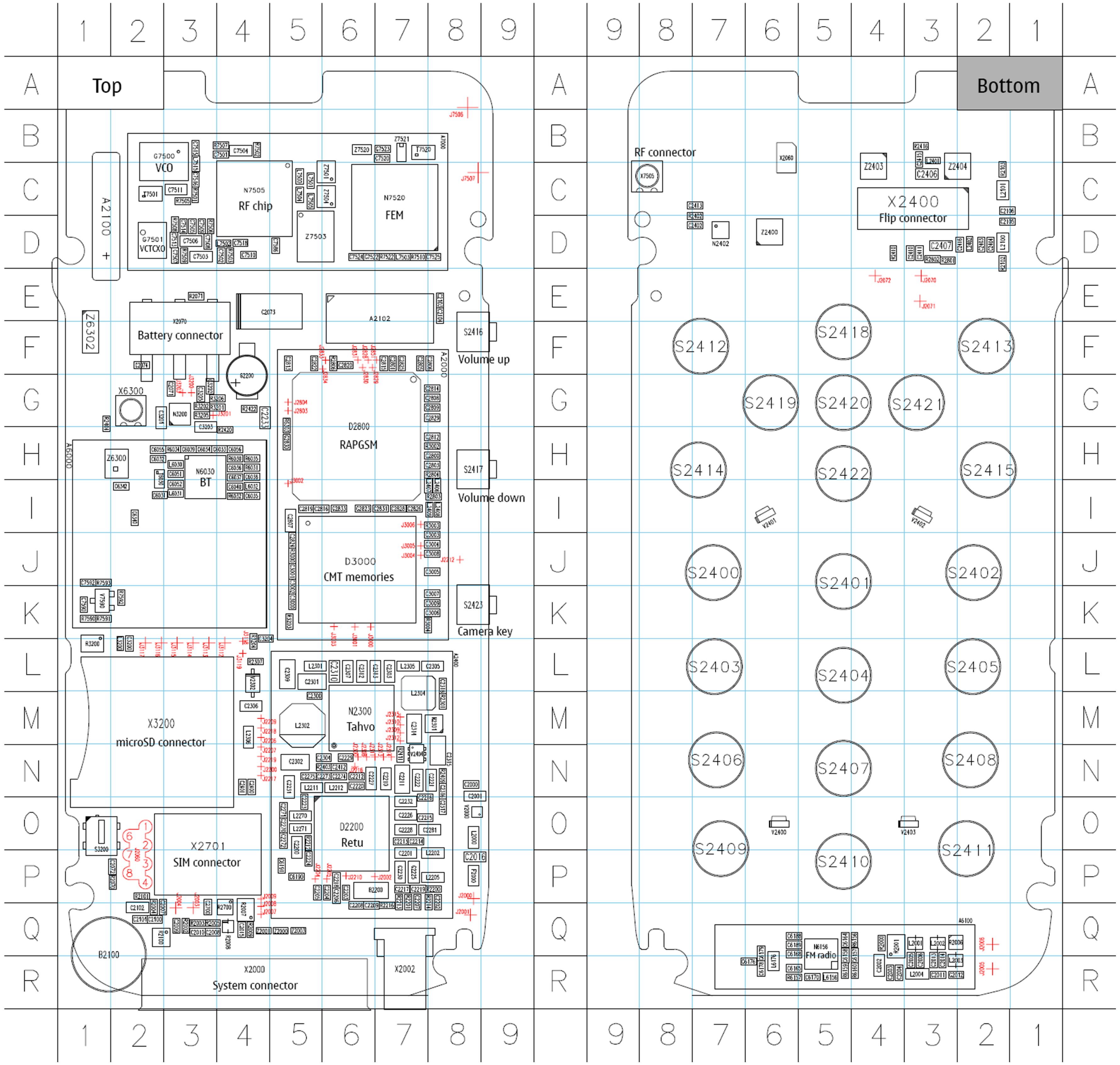
Z7520	B6
Z7521	B7


Top
Bottom
G7500 VCO
N7505 RF chip
N7520 FEM
G7501 VCTCXO
Z7503
A2100
Z6302
Battery connector
A2102
S2416 Volume up
A2000
X6300
D2800 RAPGSM
Z6300
N6030 BT
A6000
S2417 Volume down
D3000 CMT memories
S2423 Camera key
X3200 microSD connector
N2300 Tahvo
L2302
D2200 Retu
X2701 SIM connector
S3200
B2100
X2000 System connector
X2002
RF connector
X2400 Flip connector
Z2403
Z2404
Z2400
S2412
S2418
S2413
S2419
S2420
S2421
S2414
S2422
S2415
S2400
S2401
S2402
S2403
S2404
S2405
S2406
S2407
S2408
S2409
S2410
S2411
N6156 FM radio
A6100
1 2 3 4 5 6 7 8 9
9 8 7 6 5 4 3 2 1
A B C D E F G H I J K L M N O P Q R

Glossary

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A/D-converter	Analog-to-digital converter
ACI	Accessory Control Interface
ADC	Analog-to-digital converter
ADSP	Application DPS (expected to run high level tasks)
AGC	Automatic gain control (maintains volume)
ALS	Ambient light sensor
AMSL	After Market Service Leader
ARM	Advanced RISC Machines
ARPU	Average revenue per user (per month or per year)
ASIC	Application Specific Integrated Circuit
ASIP	Application Specific Interface Protector
B2B	Board to board, connector between PWB and UI board
BB	Baseband
BC02	Bluetooth module made by CSR
BIQUAD	Bi-quadratic ,type of filter function)
BSI	Battery Size Indicator
BT	Bluetooth
CBus	MCU controlled serial bus connected to UPP_WD2,UEME and Zocus
CCP	Compact Camera Port
CDSP	Cellular DSP (expected to run at low levels)
CLDC	Connected limited device configuration
CMOS	Complimentary metal-oxide semiconductor circuit (low power consumption)
COF	Chip on Foil
COG	Chip on Glass
CPU	Central Processing Unit
CSR	cambridge silicon radio
CSTN	Color Super Twisted Nematic
CTSI	Clock Timing Sleep and interrupt block of Tiku
CW	Continuous wave
D/A-converter	Digital-to-analouge converter
DAC	Digital-to-analouge converter
DBI	Digital Battery Interface
DBus	DSP controlled serial bus connected between UPP_WD2 and Helgo
DCT-4	Digital Core Technology
DMA	Direct memory access
DP	Data Package

DPLL	Digital Phase Locked Loop
DSP	Digital Signal Processor
DtoS	Differential to Single ended
EDGE	Enhanced data rates for global/GSM evaluation
EGSM	Extended GSM
EM	Energy management
EMC	Electromagnetic compability
EMI	Electromagnetic interference
ESD	Electrostatic discharge
FCI	Functional cover interface
FPS	Flash Programming Tool
FR	Full rate
FSTN	Film compensated super twisted nematic
GND	Ground, conductive mass
GPIB	General-purpose interface bus
GPRS	General Packet Radio Service
GSM	Group Special Mobile/Global System for Mobile communication
HF	Hands free
HFCM	Handsfree Common
HS	Handset
HSCSD	High speed circuit switched data (data transmission connection faster than GSM)
HW	Hardware
I/O	Input/Output
IBAT	Battery current
IC	Integrated circuit
ICHAR	Charger current
IF	Interface
IHF	Integrated hands free
IMEI	International Mobile Equipment Identity
IR	Infrared
IrDA	Infrared Data Associasion
ISA	Intelligent software architecture
JPEG/JPG	Joint Photographic Experts Group
LCD	Liquid Crystal Display
LDO	Low Drop Out
LED	Light-emitting diode

LPRF	Low Power Radio Frequency
MCU	Micro Controller Unit (microprocessor)
MCU	Multiport control unit
MIC, mic	Microphone
MIDP	Mobile Information Device Profile
MIN	Mobile identification number
MIPS	Million instructions per second
MMC	Multimedia card
MMS	Multimedia messaging service
NTC	Negative temperature coefficient, temperature sensitive resistor used as a temperature sensor
OMA	Object management architechture
OMAP	Operations, maintenance, and administartion part
Opamp	Operational Amplifier
PA	Power amplifier
PDA	Pocket Data Application
PDA	Personal digital assistant
PDRAM	Program/Data RAM (on chip in Tiku)
Phoenix	Software tool of DCT4.x
PIM	Personal Information Management
PLL	Phase locked loop
PM	(Phone) Permanent memory
PUP	General Purpose IO (PIO), USARTS and Pulse Width Modulators
PURX	Power-up reset
PWB	Printed Wiring Board
PWM	Pulse width modulation
RC-filter	Resistance-Capacitance filter
RF	Radio Frequency
RF PopPort TM	Reduced function PopPortTM interface
RFBUS	Serial control Bus For RF
RSK	Right Soft Key
RS-MMC	Reduced size Multi Media Card
RSSI	Receiving signal strength indicator
RST	Reset Switch
RTC	Real Time Clock (provides date and time)
RX	Radio Receiver

SARAM	Single Access RAM
SAW filter	Surface Acoustic Wave filter
SDRAM	Synchronous Dynamic Random Access Memory
SID	Security ID
SIM	Subscriber Identity Module
SMPS	Switched Mode Power Supply
SNR	Signal-to-noice ratio
SPR	Standard Product requirements
SRAM	Static random access memory
STI	Serial Trace Interface
SW	Software
SWIM	Subscriber/Wallet Identification Module
TCXO	Temperature controlled Oscillator
Tiku	Finnish for Chip, Successor of the UPP, Official Tiku3G
TX	Radio Transmitter
UART	Universal asynchronous receiver/transmitter
UEME	Universal Energy Management chip (Enhanced version)
UEMEK	See UEME
UI	User Interface
UPP	Universal Phone Processor
UPP_WD2	Communicator version of DCT4 system ASIC
USB	Universal Serial Bus
VBAT	Battery voltage
VCHAR	Charger voltage
VCO	Voltage controlled oscillator
VCTCXO	Voltage Controlled Temperature Compensated Crystal Oscillator
VCXO	Voltage Controlled Crystal Oscillator
Vp-p	Peak-to-peak voltage
VSIM	SIM voltage
WAP	Wireless application protocol
WD	Watchdog
XHTML	Extensible hypertext markup language
Zocus	Current sensor, (used to monitor the current flow to and from the battery)